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PRACTICAL ESSAYS

ON

AGRICULTURE:

CONTAINING

An Account of Soils, and the Manner of correcting them.

An Account of the Culture of all Field Plants, including the Artificial Grasses, according to the Old and New Modes of Husbandry, with every Improvement down to the present Period.

Also, An Account of the Culture and Management of Grass-Lands; together with Observations on Enclosures, Fences, Farms, and Farm-Houses, &c.

Carefully collected and digested from the most eminent Authors, with Experimental Remarks,

By JAMES ADAM, Esq.

VOL. II.

> Majores noſtri, virum bonum cum laudabant, ita laudabant, bonum agricolam, bonumque colonum; ampliſſime laudari exiſtimabatur, qui ita laudabatur. Cato, *De Re Ruſtica*, Lib. I.

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M.DCC.LXXXIX.

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SECOND VOLUME.

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PRACTICAL ESSAYS

ON

AGRICULTURE.

ESSAY VII.

Of the Culture of eſculent Roots.

SECTION I.

Of POTATOES[*].

IN this excellent root, which was firſt brought into Europe from America, by Sir Walter Raleigh, we have a vaſt advantage over the ancients, who certainly knew it not. That great officer, in his return home, ſtopping in Ireland, diſtributed quantities of theſe roots, which being of very eaſy cultivation, ſoon multiplied exceedingly in that country; inſomuch that in the wars which were afterwards carried on there, when all the corn above ground was deſtroyed, potatoes became the chief ſupport of the people. The Philoſophical Tranſactions obſerve likewiſe, that the Iriſh were relieved, by the help of this root, from their laſt ſevere famine, which continued for two years, during which all their own corn failed. From Ireland it came next into Lancaſhire, now famous for its potatoes; and within theſe laſt fifty years, the culture of this very uſeful plant has been extended to every county in Great-Britain.

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[*] Potatoe is evidently a corruption of the Indian name *batata*.

Mr. Miller diſtinguiſhes only two general varieties of theſe plants; the red rooted, which carry purpliſh flowers, and the white rooted, which bear white flowers.

The Iriſh huſbandman blames the Engliſh, for planting this root uncut; becauſe it often contains five or ſix eyes, or perhaps more, from which the produce of the enſuing year is to ſpring; and alſo, for not allowing that bulb, or rather, the greater number of ſhoots and bulbs that proceed from it, a ſpace of earth ſufficient for their nouriſhment; which is the reaſon why ſo many poor, ſtunted, unſerviceable potatoes, are dug up in the autumn. The practice in Ireland is, to chooſe middle-ſized roots, for the largeſt are generally made uſe of for the table; then, to ſingle out the eyes that ſeem ſtrongeſt and moſt vigorous, and to cut them out in ſquares of at leaſt half an inch every way: ſo that one root will ſometimes furniſh three or four good pieces to ſet.

The ground, prepared for planting, is marked out for beds four or five feet wide, with intermediate alleys of two or three feet wide. It is then trenched, only a ſingle ſpit deep, and the bottom of this trench, made as in common garden trenching, is covered with dung, long and ſhort, taken out of a wheel-barrow which ſtands at the labourer's elbow. The potatoe-eyes, cut as before directed, are placed upon this dung, at about five or ſix inches aſunder; and this trench is filled with the mould taken out of the next, which is marked by a line at the diſtance of two or three feet. This trench is again filled with the mould of the next, and ſo on to the laſt, which is filled from the alley. The uſe of the dung thus laid at the bottom of the trenches is, not only to make the roots grow ſingle, for not above one root, or two at moſt, will in this caſe be produced by each eye, and theſe will be large, and well fed; but it is attended with the farther advantage of making the potatoes run, and ſpread themſelves to a certain determinate depth; which is no ſmall help to their growing large.

Theſe ſets are planted in February or March, and in April or May. As ſoon as they begin to riſe, the earth muſt be dug out of the alleys, as is done for aſparagus, and the potatoe-bed is covered with it, about five or ſix inches deep. This will give new life and vigour to the roots, will keep the green from running too much to haulm, and will make the bulbs grow much the larger. By theſe means the crop of fine large potatoes will be almoſt double what is obtained when they are planted promiſcuouſly in the common way: nor will any farther culture be requiſite, till they are fit to be dug up, except the pulling up of the largeſt weeds.

Mr. Miller's reaſons for diſapproving of planting either the ſmall off-ſets entire, or the eyes cut out of the larger roots, are, that though the former generally produce a greater number of roots, theſe roots are always ſmall; and that the cuttings of the larger roots are apt to rot, eſpecially if wet weather happens ſoon after they are planted. He therefore recommends, to make choice of the faireſt roots for ſetting, and to allow them a larger ſpace of ground, both between the rows, and between the plants in the rows; and he aſſures us that he has obſerved, when this method has been followed, that the roots in general have been large the following autumn. M. du Hamel, in his Elements of Agriculture, does not at all object to the planting of the cuttings.

The ſoil in which this plant thrives beſt is, a light ſandy loam, neither too dry nor too moiſt, but brought to a fine tilth, and ploughed deep; for the deeper the earth is looſened, the finer and larger the roots will grow.

Mr. Miller ſays, that in the ſpring, juſt before the laſt plowing, a good quantity of rotten dung ſhould be ſpread on the ground, and this ſhould be plowed in early in March, if the ſeaſon be mild; otherwiſe, it ſhould be deferred till the middle or end of that month: for if a hard froſt comes on ſoon after the roots are planted, they may be greatly injured.

The laſt plowing ſhould lay the field even, and then furrows ſhould be drawn three feet aſunder, and ſeven or eight inches deep. The roots ſhould be laid at the bottom of theſe furrows, about one foot and a half aſunder; and they ſhould be then covered with earth. After all the ground is planted in this manner, and when the ſhoots are expected to appear, then it ſhould be well harrowed both ways, as well to looſen the ſurface, as to tear up the young weeds, which will have begun to grow by that time.

Mr. Miller places the rows at three feet diſtance, in order to introduce the horſe-hoe between them, as that will greatly improve the roots; for by twice ſtirring and breaking of the ground between theſe plants, not only weeds will be deſtroyed, but the ſoil will be ſo looſened, that every ſhower of rain will penetrate to the roots, and greatly quicken their growth. But theſe operations ſhould be performed early in the ſeaſon. The firſt horſe-hoeing ſhould be given when the plants are about five or ſix inches high; and the ſecond, when they are about twelve or fifteen; and at each of theſe, the rows ſhould be earthed up; but with care not to cover any of their ſtalks.

As theſe horſe-hoeings can only deſtroy the weeds between the rows, it will be neceſſary to uſe the hand-hoe, to ſtir the ground and deſtroy the weeds in the rows, between the plants. If this be well done in dry weather, it will be ſufficient to keep the ground clean until the potatoes are fit to be taken up; which will be very ſoon after the firſt froſt in autumn has killed the haulm.

They ſhould not remain much longer in the earth, leſt the roots themſelves be froſt-bitten, which ſpoils them. A four or five-pronged fork is better to dig them up with than a ſpade, becauſe it is leſs apt to cut them: but a principal thing to be conſidered in this is, the clearing of the ground; for if any are left, they will ſhoot up among the new crop, whatever it be, and do conſiderable damage, eſpecially if it be wheat ſown broad-caſt.

If the farmer apprehends that his land has not been thoroughly cleared of the potatoes, and is therefore afraid of their hurting the enſuing crop; his beſt way will be to lay it up very rough, againſt winter; becauſe the froſts of that ſeaſon are known to kill and rot all potatoes in the ground, which are expoſed to them; and it will at the ſame time be thereby finally prepared for ſpring corn; eſpecially as it will have been well enriched, by the haulm of the potatoes lying upon it.

Though potatoes delight moſt in a light ſandy ſoil; yet Mr. Maxwell ſays, that he has ſeen them thrive well on ground that ſeemed very bad; even in deep bog or moſs, which could not bear horſes to plough it, but is conſiderably bettered by them; and on coarſe heath, where they were ſucceeded by grain, without more dung than was laid on at firſt. Of ſo improving a nature are they, and ſo much is the land enriched by the rotting of their ſtalks among it, and the digging it gets in raiſing them.

Mr. Higſon, a correſpondent of the Bath Society, ſays, that ground for potatoes ſhould be well manured with rotten horſe-dung, and the ſeed changed every year. They ſhould alſo be planted in freſh ground every year; for if either freſh, or the ſame ſeed, be planted in the ſame ſoil, two or three years ſucceſſively, the crops will in general fail, the haulm come up curled and blighted, and the roots will be worm-eaten and cankered.

Potatoes ſhould not be planted deeper than four inches, or four inches and a half, and the ſeed or ſets ſhould be one inch or one inch and a half above the dung. Whole potatoes ſhould be planted at the diſtance of two feet and a half, or three feet ſquare. Mr. Higſon has often ſeen potatoes planted upon ground without dung, ten or twelve inches deep. But theſe crops have always failed, as he ſuppoſes, for want of proper nouriſhment.

He tried the following experiment for five years ſucceſſively. The firſt year, on the ſame day, and in the ſame ground, he planted whole potatoes in ranks, at the diſtance of three feet ſquare; and cuts of the ſame kind, at eighteen inches ſquare. During the laſt four years, he planted whole potatoes at the diſtance of two feet and a half ſquare, and cuts at eighteen inches.

The whole ſets were earthed up three or four times; that is, as long as the haulm would ſtand; and a few ranks of the cuts were earthed up alſo. The whole-ſets always produced a greater crop than the cuts, in proportion to the quantity of ground; and the potatoes were larger and fairer. He obſerved little or no difference in the produce of the cuts, whether the ranks were earthed up or not, which he accounts for thus, that the whole-ſets having freſh mould drawn up to them on all ſides, have a large ſpace round them; but the cuts having a ſmall ſpace round them, were but poorly ſupplied.

Mr. Higſon mentions a ſmall white ſort of potatoe, cultivated of late years at Altringham in Cheſhire. This they plant in January, or as ſoon as the earth is dry and the weather mild. This ſpecies never blows; but is fit for uſe a month or ſix weeks ſooner than any other kind. He has known the following experiment tried with good ſucceſs. The above ſpecies has been planted in October, and if there comes hard froſt without ſnow, they cover the potatoes with pea-haulm, bean-haulm, ſtraw, or other light covering. The whole crop is dug up in May, and another crop immediately put in; which is alſo dug up in October following. He has himſelf eaten new potatoes thus raiſed, in April.*

The Norfolk Agricultural Society gave a premium to Mr. Wright of Great Melton, for planting and gathering the beſt crop of potatoes; the quantity of land being one rood, and the produce ninety-one buſhels. On that occaſion, the Society greatly recommend the culture of this moſt valuable root; not only for its being an excellent and wholeſome food, in various modes of application, but is beſides well known to make a ſweet and nouriſhing bread, when mixed in equal quantities with the flour of wheat; and they add, that they think it almoſt unneceſſary to obſerve on that ſubject, what every intelligent farmer is already appriſed of, that as good a crop of wheat may be expected after well cultivated potatoes, as in any other mode of huſbandry.

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* Bath Soc. Tranſ. Vol. I. p. 28.

Calculation for cultivating one acre of land with potatoes according to Mr. Wright's expences, and the valuation of his crop.

One deep plowing	£0	4	0
Seed, thirty-two buſhels at one ſhilling per buſhel	1	12	0
Manure, twenty-four loads, at two ſhillings per load	2	8	0
Expence of ſetting in dry weather, at extra charge	1	0	0
Hoeing and earthing up ſeveral times	1	0	0
Expence of taking up	5	8	0
Rent and other charges	1	10	0
	£13	2	0
Produce, three hundred and ſixty-four buſhels, at one ſhilling per buſhel	18	4	0
Clear profit	£5	2	0

It ſhould here be obſerved, that only one half of the expence of manure ought properly to be charged to the potatoes; as the land remains in fine order for any ſucceeding crop.

One ſhilling per buſhel is the price on the ſpot, and therefore no expence of carriage is ſtated.

The price ſtated for taking up the crop appeared ſo extraordinary to the Bath Society, that they ordered their Secretary to enquire the meaning of it; and he was informed, that in order to have the crop taken off perfectly clean, Mr. Wright had all his ground ridged up: that he had alſo had all his crop picked over, and ſeparated into different ſorts, which had taken up a conſiderable time, and occaſioned an extra expence.

But an acre of potatoes, producing three hundred and ſixty-four buſhels, may probably be taken up in the uſual way, for about half the expence above ſtated; and half the expence of manure being deducted, the neat profit of an acre thus cultivated, and producing ſuch a crop, would be at leaſt nine pounds.

When I conſider the great utility of this moſt excellent root, which affords ſo much nouriſhment to men, to all ſorts of cattle, and even to poultry, I cannot too ſtrongly recommend the culture of it.

The beſt way of keeping potatoes, during winter is, to lay them in a dry place, in very dry ſand, or in fine dry earth.

If horſes eat potatoes reluctantly at firſt, they may be eaſily broke in to it, by mixing with them two or three times ſome marſhmallows, of which they are extremely fond.

When given to cows, oxen, or hogs, they are much improved, by being thrown into an oven, after baking of bread, and there dried: this renders them much more farinageous and more fattening; the cold raw ſap being thereby exhauſted: but if this cannot be conveniently done, they muſt be given raw to the cattle: and for hogs they may be boiled, and mixed with their other trough-meat, ſuch as pollard, barley-meal and peaſe; for though hogs will eat them raw, yet they are much more fattening when boiled: and there is nothing they devour with more eagerneſs, than ſuch a meſs as I have deſcribed.

If potatoes were introduced regulary in the farmer's courſe of crops, nothing perhaps would anſwer better: the land, by means of their culture would be brought into fine order; and I ſhould think he might ſave himſelf the trouble and expence of cleaning the ground after them, by only gathering the beſt of the crop and turning in his hogs to glean the remaining part; by which means the hogs would be fattened, the field would be richly manured with their dung, and the formidable article of taking up, above ſtated by Mr. Wright, would be almoſt wholly ſaved.

Nothing is more intereſting to a farmer, or clears up his ideas more, than actual ſtatements of the expence and produce of any crop: I ſhall therefore tranſcribe from the Tranſactions of the Bath Society, an account of the culture and produce of ſix acres of land, of about twenty ſhillings value per acre, by John Billingſley Eſq; who ſays, that in the year 1781 this field was in graſs, an old turf that had not been plowed for more than twenty years.

The firſt year, 1782, black oats on the lay.

Plowing, not wider than ſix inches, or more than three inches deep, at ten ſhillings per acre	£3	0	0
Seed, five buſhels per acre, and ſowing	4	10	0
Harrowing with blunt ſhort tines, at two ſhillings per acre	0	12	0
Replacing the turf pulled up by the harrow	0	3	0
Mowing, harveſting, and ſecuring, ſix ſhillings per acre	1	16	0
Carry over	£10	1	0

Getting

Brought over	£10	1	0
Getting in, threſhing, &c. and winnowing, at one ſhilling and ſix-pence per quarter	2	5	0
Rent	6	0	0
Tithe	0	12	0
Sundry expences, ſuch as highways, &c.	0	6	0
Total expence	£19	4	0

Produce.

Thirty quarters of oats, at twenty-ſix ſhillings per quarter	39	0	0
N. B. Some ſold at thirty-two ſhillings.			
Ten loads of ſtraw at twelve ſhillings	6	0	0
	45	0	0
Deduct expences as above	19	4	0
Profit	25	16	0

It ſhould be remarked, that this great profit ariſes, principally, from the uncommon price of oats; which, though ſold this year for near thirty ſhillings, are uſually ſold for fourteen or fifteen ſhillings per quarter.

Second

Second year, 1783, Potatoes.

November 3, 1782, Plowing the oat ſtubble, at four ſhillings	£1	4	0
March 7, 1783, Another plowing, at four ſhillings	1	4	0
March 25, Harrowing, at two ſhillings	0	12	0
Thirty cart-loads of dung per acre, at three ſhillings per load, hauling included	27	0	0
April 27, Began planting, and finiſhed May 25, in beds eight feet wide, and the alleys two feet and a half wide: placed the ſets at one foot diſtance on the fallow, then ſpread the dung on them, after which they were covered three or four inches deep with earth from the alleys, at twenty-ſix ſhillings per acre	7	16	0
Seed from Dumfries in Scotland (very high price), five ſacks to an acre, at fourteen ſhillings	21	0	0
June 15, Hoeing, at ſix ſhillings	1	16	0
Aug. 3, Hand-weeding at four ſhillings	1	4	0
Oct. 18, Digging up at forty ſhillings per acre	12	0	0
Hauling, pitting, thatching, &c.	4	0	0
Tythe	1	10	0
Carry over	£79	6	0

Rent

Brought over	£79	6	0
Rent	6	0	0
Sundries	0	6	0
Total	£85	12	0

Produce.

Beſt potatoes, five hundred and fifty ſacks, of 240lb. at four ſhillings	110	0	0
Middling ditto, one hundred ſacks, at three ſhillings and ſixpence	17	10	0
Small ditto, fifty ſacks, at two ſhillings and ſixpence	6	5	0
	133	15	0
Deduct expences, as above	85	12	0
	£48	3	0

Which is upwards of eight pounds profit per acre, and the land left in excellent order for wheat*.

The Rev. Mr. Cloſe, of Trimley, Suffolk, after recommending much the culture of this admirable root, gives us his method of cultivating it, by firſt pulverizing well by two or three plowings and harrowings, after which he manures with fifteen or twenty cart-loads of dung per acre, before it receives its laſt earth. Then it is thrown on to what the Suffolk farmers call the trench-balk, which is narrow and deep ridge-work, about fifteen inches from centre to centre of the ridges. Women and children drop the ſets in the bottom of every furrow, fifteen inches apart; men follow, and cover them with large hoes, a foot in width, pulling the mould down, ſo as to bury the ſets five inches deep; they muſt receive two or three hand-hoeings, and be kept free from weeds; always obſerving to draw the earth as much as poſſible to the ſtems of the young plants. After repeated trials, the ſecond week of April is found to be the moſt advantageous ſeaſon for planting.

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* Bath Soc. Tranſ. Vol. III. p. 109.

In the end of September, or beginning of October, when the haulm becomes withered, they ſhould be plowed up with a ſtrong double-breaſted plough. The workman muſt ſet his plough deep, to avoid hurting the crop. The women who pick them up, if not carefully attended to, will leave many in the ground, which will prove detrimental; and ſhould be prevented by harrowing the land, and turning in the ſwine to glean the few that may be left.

By this method, the ſets will be fifteen ſquare inches from each other; it will take eighteen buſhels to plant an acre; and the produce, if on a good mixed loamy ſoil, will amount to three hundred buſhels.

If the potatoes are grown as a preparation for wheat, it would be better to have the rows two feet two inches apart, hand-hoeing only the ſpace from plant to plant in each row; then turning a ſmall furrow from the inſide of each row, by a common light plough; and afterwards, with a double-breaſted plough, and one horſe, ſplit the ridge in the middle of the interval, which will deſtroy the weeds, and earth up the plants. This work ſhould not be done too deep the firſt time, to avoid burying the tender plants; but the laſt earth ſhould be plowed as deep as poſſible; and the cloſer the mould is laid to the ſtems of the plants, the more advantageous it will prove.

Thus, fifteen buſhels will plant an acre, and the produce will be ſtill about three hundred buſhels; but the land, by the ſummer-plowings, will be prepared to receive ſeed-wheat immediately, and almoſt inſure a plentiful crop.

If potatoe ſets are uſed, they ſhould be cut a week before planting, with one or two eyes to each, and the pieces not very ſmall. If two buſhels of freſh ſlacked lime were ſown over the ſurface of the land, as ſoon as planted, it would effectually prevent the attacks of the grub.

The expence attending an acre of potatoes well cultivated in the firſt method, ſuppoſing the rent twenty ſhillings, tythe and town charges rather high (as in Suffolk), taking up, and every thing included, will be about ſix pounds. In the laſt method it would be ſomewhat reduced.

Mr. Cloſe for many years ſold the greateſt part of his crop, at ſeven ſhillings per ſack of three buſhels: then one hundred ſacks would amount to thirty-five pounds; but they are now ſo much cultivated, that, to make a ſure eſtimate, they ſhould be valued only as applicable to the feeding and fattening of cattle.

He ſays from experience, they are worth three ſhillings per ſack, for theſe purpoſes, and then the produce as above would amount to fifteen pounds per acre.

They are excellent food for hogs; roaſting pork is never ſo moiſt and delicate as when fed with potatoes, and killed from the barn-door, without any confinement. For bacon and hams, two buſhels of pea-meal ſhould be well incorporated with four buſhels of boiled potatoes; which quantity will fat a hog of twelve ſtone (fourteen pound to the ſtone). Cows are particularly fond of them; half a buſhel at night, and the ſame quantity in the morning, with a ſmall allowance of hay, is ſufficient to keep three cows in full milk: they will yield as good and as ſweet butter as the beſt graſs.

Mr. Cloſe adds, that in fattening cattle, he gives them as much as they will eat: a beaſt of about thirty-five ſtone will require a buſhel per day, but will fatten one third ſooner than on turnips.

The potatoes ſhould be clean waſhed, and not given till dry: they do not require boiling for any purpoſe but fattening hogs for bacon, or poultry, which laſt eat them greedily. He prefers the champion to any other ſort he ever cultivated. With him, they did not anſwer ſo well as he expected for horſes, though ſome gentlemen have approved of them as ſubſtitutes for oats.

When predilections for old cuſtoms are ſubdued, Mr. Cloſe hopes to ſee the potatoe admitted in the conſtant courſe of crops, by every ſpirited huſbandman; and thinks the moſt beneficial effects would acrue from ſuch a ſyſtem. Mr. Cloſe ſays, very ſenſibly, that they are a moſt valuable article for the poor; who, in his neighbourhood, partly maintain themſelves, and feed their children, upon them. They are excellent ſubſtitutes for peas in broths, and make a very uſeful ingredient in a cheap ſtew for the common working people.*

With all theſe advantages, it is not poſſible to recommend the culture of them too much; for where theſe are in plenty, the poor can never be ſaid to want food. Indeed, I do not know whether this plant and the Jeſuits bark, be not the only benefits that Europe has ever gained by the diſcovery of the weſtern world.

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* Lond. Soc. Tranſ. Vol. III. p. 111.

Wherever there ſeems to be an exact account given of expences and produce, I am always deſirous to inſert it. I ſhall therefore add the following, from the Bath Society's Tranſactions.

The field was four acres and a half, the ſoil very poor, being light, looſe, and ſandy ; worth about ten ſhillings per acre, and had been down in graſs two years. In January, ten waggon-loads of dung per acre, were carried over it ; and the following month it was folded over, and plowed as deep as the ground would bear, then harrowed ſmooth.

The potatoes were planted in March, eighteen buſhels per acre, cut in two, three, or four pieces, according to their ſize, and let in with iron bars, in rows two feet aſunder, and one foot diſtant in the rows. They were of the great white kind, with large eyes ; name unknown. They were hand-hoed ſoon after they were up, and horſe-hoed a little while after. The horſe-hoe was made to earth them well up, and performed it ſo completely, that it contributed much to the ſucceſs of the crop. Nothing more was done till the end of October, when they were taken up. The produce per acre was four hundred and eighty buſhels, or one hundred and ſixty ſacks ;

they were ſold on the ſpot at four ſhillings per ſack. Expences as follow;

Eighteen buſhels planted per acre, at two ſhillings	£1	16	0
Cutting ditto	0	6	0
Hand-hoeing, four ſhillings, horſe-hoeing, two ſhillings per acre	0	6	0
Planting, per acre	0	8	0
Expence of taking up, per acre	2	8	0
	£5	4	0

N. B. The expence of carrying home not included.

Produce,

One hundred and ſixty ſacks, at four ſhillings per ſack	£32	0	0

Here the profit appears to be very conſiderable: but it ſhould be obſerved, that in this calculation, there are no allowances made for cultivating the land, with rent, tythe, and manure, &c.

There have been inſtances of potatoes planted ſo late as June, having ſucceeded wonderfully well, ſo as to produce very good crops: but this practice I would not recommend; for, ſingular ſucceſs in particular ſeaſons ought not with the judicious, to eſtabliſh a rule. I would therefore adviſe the planting them towards the middle, or at lateſt, in the end of April; when they will run little or no riſk from froſts, and have full time to come to proper ſize and maturity by the month of October, which is the beſt time for taking them up.

Mr. Baker, who has given us the reports of the experiments made by the Dublin Society, informs us, that having tried the culture of potatoes, by putting dung over them, and under them, he found thoſe ſucceed beſt, where they lay over the dung: at the ſame time I muſt obſerve, that they would be better if not laid in contact with the dung, but had a thin ſtratum of earth between.

A noble Lord in my neighbourhood, collects the leaves from his trees, and lays them over the plants, before they are covered with the mould: this is a very ſenſible plan; becauſe they not only afford additional manure, but keep the earth light upon the ſeed, which gives them an opportunity of ſpreading their fibrous and fruitful roots.

The idea, which I mentioned before, reſpecting the culture of the Scotch and Anjou cabbages, might, I am well convinced, be very ſucceſsfully applied to that of potatoes; differing, however, ſomewhat in the manner of planting them. Let us therefore ſuppoſe the ground in which they are to be ſet, is properly prepared by plowing, as before mentioned: let then furrows be drawn in it at four feet diſtance all over the field, and croſſed by other furrows at an equal diſtance. Where theſe interſect each other, lay in ſome dung, from a wheel-barrow, extending from the point of interſection fourteen or fifteen inches each way: let a man, following, ſpread a little of the mould from the furrow over the dung; let a third hand lay down the ſeed in a quincuna form, that is, put one whole ſound potatoe at the point of interſection, and one in each furrow, at a foot diſtance from the center, which will make five in all: a fourth hand ſhould now follow with a barrow full of leaves, and lay them over the plants, ſhould then ſprinkle ſome mould lightly over them, and leave them ſo till the plants ſhoot.

Thus the plants will occupy a ſpace of two feet each way out of the four feet between the furrows; and the remaining intervals between the plants on each ſide, will alſo be two feet; which intervals I would horſe-hoe at the proper periods, firſt one way of the field, and then acroſs; laying the mould upon the plants at each hoeing; ſo that the ſpaces which the plants occupied, would by theſe means become little ſquare hills, filled with roots: and the intervals between, being thus hoed and croſs-hoed, would have the uſual good effects of pulverizing the ſoil, deſtroying the weeds, and preparing

ing the land in the beſt manner poſſible for a crop of wheat.

Potatoes, like all other plants, are ſubject to diſtempers: that which ſeems to infect theſe is called the curled diſeaſe, or blight. It firſt ſhows itſelf by a defect and curling in the leaves and ſtalks of the plant, the cauſe of which is not yet perfectly underſtood; though I am convinced it is the ſame effect, proceeding from many different cauſes, of which I ſhall preſently have occaſion to ſpeak.

In treating of this diſtemper, which is often very fatal to whole fields of potatoes, ſome recommend one remedy, and ſome another. Mr. Smith, a correſpondent of the Bath Society recommends, as a preventive, planting them in the autumn rather than in ſpring.

He directs to plant them in rows pretty deep, and to draw the earth over them with a hoe, ſo as to keep them from the froſt. In the ſpring, ſays he, take down the ridges raiſed by the hoe, and when the weeds appear, hoe the intermediate ſpace between the rows; and when the plants appear, draw up the earth round them. They will be better if dung is put in the trenches when the potatoes are planted, for it will help to preſerve the roots from the froſt.

It is well known, adds he, that bulbous-rooted flowers never bloſſom well, if removed in the ſpring: now as potatoes are bulbous, the ſame inferences may be drawn in regard to them. The beſt time for planting tulip-roots is, the month of November; for which reaſon, he thinks that time is alſo beſt for pototoes.*

Another correſpondent of the ſame Society is of opinion, that this diſtemper proceeds principally from the uſe of bad ſeed, which, in planting potatoes, is generally the rubbiſh of the crop; whereas intelligent farmers are very particular, nay even curious, in the choice of their ſeed-grain.†

A third is of opinion, that this diſeaſe is cauſed by an inſect produced by froſt, or bad keeping before ſetting.§

A fourth attributes the cauſe of this diſeaſe to a white grub, or inſect which he found near the root, about half an inch long, with eight or ten legs, its head brown and hard; and upon examining a number of the curled roots, he found them all bitten, chiefly from the ſurface to the root, which of courſe ſtopped the progreſs of the ſap, and threw the leaf into a curl. The uncurled roots were not bitten.

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* Bath Soc. Tranſ. Vol. II. p. 297.

† Bath Soc. Tranſ. Vol. II. p. 247.

§ Bath Soc. Tranſ. Vol. I. p. 240.

He tried a few experiments, as ſollow. Firſt, he put ſoot to the inſects in the rows for two days, and after that put lime to them for the ſame time, but they ſtill kept lively: next, he put a little ſalt, which deſtroyed them in a few hours. From whence he infers, that if coarſe ſalt were put into the ground, at the time it is preparing for potatoes, it would effectually cure this diſtemper.*

Theſe are but a few of the many cauſes aſſigned for the curled diſeaſe or blight in potatoes, which probably may be all true: and although many remedies have been preſcribed, yet as the cauſes are not perfectly underſtood, their effects are more uncertain. Certain it is, however, that many of the preventives here mentioned, are rational and ſalutary; ſuch as, good ſeed, whole potatoes, or large ſets, good land well plowed; and if alſo well limed, there is great reaſon to believe that, with timely hoeing, particularly horſe-hoeing, the crop would eſcape unhurt by any diſtemper whatever.

I have here recommended whole potatoes or large ſets, and have ſince obſerved from a ſeries of accurate experiments, made by Mr. Anderſon of Edinburgh, and tranſmitted by him to the Society at Bath, that he is perfectly convinced of the great utility of this precaution; having always found, that there ſhould be conſiderable ſubſtance in the ſeed, in order to have a fruitful crop.

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* Bath Soc. Tranſ. Vol. I. p. 241.

Perhaps no manure agrees ſo well with potatoes, as lime; they like a ſweet dry land; and lime both ſweetens and dries, at the ſame time that it kills vermin more than any other thing. Potatoes are much injured by wet; even too much dung hurts them in this reſpect, and therefore, when planted with dung, it is certainly right, to draw ſome earth over it, before the ſets are put in the trench.

It has been obſerved by farmers, that if the potatoe-haulm is eaten off by cattle, the root does not grow to any ſize: from hence it ſeems certain, that this, like moſt other ſucculent plants, receives much nouriſhment by its leaves. When the haulm begins to decay, and becomes of a dark brown, it is no longer uſeful to its roots, and may then be eaten without injury.

I believe there is no culture better adapted to the reclaiming and improving of uncultivated, waſte, or wood-lands, than that of the potatoe.

Ireland can furniſh proofs of this, in numberleſs inſtances. Many large tracts of wood-land have been ſtubbed up, and brought into fine tilth by means of the potatoe-huſbandry: and much are the poor and wretched inhabitants of that country indebted to this excellent plant; by which alone, thouſands of families are maintained for two thirds of the year.

Mr. Joſeph Hazard, a correſpondent of the Bath Society, and who ſeems to be a man of much experience in the culture of potatoes, gives the following directions concerning them.

It may be right, ſays he, to inform thoſe who have only a ſmall ſpot of ground, how they may obtain a plentiful crop.

Firſt then, the earth ſhould be dug twelve inches deep, if the ſoil will allow of it; a hole ſhould be opened about ſix inches deep; horſe-dung, or long litter, ſhould be put into it three inches thick; the hole ſhould not be more than twelve inches diameter: upon this dung, or litter, a potatoe ſhould be planted whole, upon which a little more dung ſhould be ſhook, and then earth put over all. The whole plot of ground ſhould be treated in the ſame manner, taking care that the potatoes be ſixteen inches apart: and when the young ſhoots make their appearance, they ſhould have freſh mould drawn over them with a hoe: and if the tender ſhoots are covered, it will prevent the froſt from injuring them: they ſhould again be earthed, when the ſhoots make a ſecond appearance, but not ſo as to be covered; as in all probability the ſeaſon will be then leſs ſevere.

A plentiful ſupply of mould ſhould be given them, and the perſon who performs this buſineſs, ſhould never tread on the plant or hillock round it ; as the lighter the earth is, the more room the potatoes will have to expand. From a ſingle root, thus planted, very near forty pounds of large potatoes were obtained ; and, in general, over the whole plot, they produced from fifteen to twenty pounds weight from each root. Cuttings, or ſmall ſets, will not do for this purpoſe.

The ſecond method will better ſuit the indolent, or thoſe who have not time to dig their ground.

Where weeds much abound, and have not been cleared in the winter, a trench may be opened in a ſtraight line, the whole length of the ground, and about ſix inches deep : in this trench, the potatoes ſhould be planted about ten inches apart : ſmall potatoes, or cuttings will do for this method. When they are laid in the trench, the weeds that are on the ſurface may be pared off on each ſide, about ten inches from it, and be turned in upon the plants : another trench ſhould then be dug, and the mould from it ſhould be laid carefully over the weeds in the former trench. The trenches ſhould be regularly dug, in order that the potatoes may be ten or twelve inches from each other, throughout the piece. Even this ſlovenly method will, in general, raiſe more potatoes than can be produced by digging the ground twice, and dibbling in the plants; and the reaſon is, that the weeds lighten the ſoil, and give the roots room to expand. They ſhould be twice hoed and earthed up in rows. If cut potatoes are to be planted, every cutting ſhould have two eyes: for though fewer ſets will be obtained, there will be a greater certainty of a crop; as one eye of ten fails, or is deſtroyed by grubs in the earth.

Where a crop of potatoes fails in part, as will be the caſe in a dry ſeaſon, they may ſtill be made to ſucceed, by laying a little dung on the knots of the ſtraw or haulm of the potatoes that do appear, and covering them with mould; each knot or joint thus managed will, if the weather prove wet afterwards, produce more potatoes than the original roots.

From the ſmalleſt potatoes planted whole, from four to ſix pounds have been produced; and ſome of the ſingle potatoes weighed near two pounds. Theſe were dug in, as before mentioned, in trenches, where the ground was covered with weeds, and the ſoil was a ſtiff loamy clay. Theſe ſmall potatoes are held in great contempt for planting, by thoſe whoſe prejudice will not allow of their trying experiments: but upon trial, they will be found to anſwer perfectly well; though they ought by no means to be dibbled in; as the perſon uſing the dibble treads the ground, and thereby prevents the young fibres from expanding.

A good crop may be obtained, by laying potatoes upon turf, at about twelve or fourteen inches apart, and upon beds of about ſix feet wide, on each ſide of which a trench ſhould be opened about three feet wide; and the turf that comes from thence ſhould be laid with the graſſy ſide downwards upon the potatoes. A ſpit of mould ſhould next be taken from the trenches, and ſpread over the turf; and in like manner the whole ſpot of ground to be planted ſhould be treated. When the young ſhoots appear, another ſpit of mould from the trenches ſhould be ſtrewed over the beds, ſo as to cover the ſhoots: this will prevent the froſt from injuring them, encourage them to expand, and totally deſtroy the young weeds; and when the potatoes are taken up in the autumn, a careful perſon may again turn the earth into the trenches, ſo as to make the ſurface level: and it is proper to obſerve, that a better crop of potatoes may be obtained from the ſame ground the year following.

For field-planting, a good, if not the beſt method is, to dung the land, which ſhould be previouſly plowed. When it is plowed a ſecond time, a careful perſon ſhould drop the potatoe plants before the plough in every third furrow, at about eight or ten inches apart. Plants cut with two eyes are beſt for this purpoſe. The reaſon for planting them at the diſtance of every third furrow is, that when the ſhoots appear, a horſe-hoe may go upon the two vacant furrows, to keep them clean; and after they are thus hoed, they ſhould be moulded up in ridges: and if this crop be taken up about October or November, the land will be in excellent condition to receive a crop of wheat; though I ſhould prefer taking up the potatoes ſooner, in order to get my wheat ſooner in the ground.

Lands that are full of twitch or couch-graſs, may be made clean by this method; as horſe-hoeing is as good as a ſummer-fallow: and if, when the potatoes are taken up, women and children were to pick out that filth, not any traces of it would remain, and by laying it in heaps and burning it, a quantity of aſhes would be produced for manure.

Dibbling, planting, and hoeing, all tread the ground, and therefore ſhould be done with care; for the mould over potatoes ſhould be as light as poſſible, to allow the younger roots to ſhoot out and extend themſelves. This it is, that makes it ſo eligible to lay leaves, or weeds, or long litter, over the young plants, before the earth is laid upon them.

Vacant ſpaces in hedge-rows might be grubbed up, and planted with potatoes; and a good crop might be expected, as the leaves of trees, thorns, &c. are a good manure, and will ſurpriſingly increaſe their growth.

Beſides that the cultivating of ſuch places is a ſaving of other ground, it haſtens the growth of the hedges, and occupies a ſpace which is too often filled with weeds: and this ſpace will be well prepared for corn another year.

Gravelly, ſtrong, chalky, or ſtiff clay land, will never produce many potatoes; and the few they do produce, will be cankered, and only fit for pigs. Such ſoils are therefore improper*.

The Rev. Mr. Cloſe, of Trimley, in Suffolk, tried an experiment on the culture of potatoes, which I ſhall here relate.

An acre of mixed loamy land was plowed three times after a crop of cabbages, and on the 28th of April 1784, half of it was ſet with the beſt Poland oats; occupying ſpaces of two feet and two inches, and leaving intervals of the ſame width.

On the 12th of May thoſe intervals were ſplit with a double-breaſted plough, and planted with champion potatoes. Auguſt 24th, the oats were cut; and when threſhed yielded ten coombs, or five quarters of extraordinary large, heavy grain. October 5th, the potatoes were plowed up, and produced thirty ſacks of very fine potatoes, half of which ſold at ſix ſhillings per ſack, and half at ſeven ſhillings.

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* Bath Soc. Tranſ. Vol. III. p. 292.

The potatoe-land was immediately ſet with wheat, and promiſed a fine crop.

The oat-ſtubble, after having ſeveral plowings, was, on the 16th of April, planted with potatoes. The produce per acre of land ſo cultivated, ſtood thus:

Thirty ſacks of potatoes ſold for	£9	15	0
The five quarters of oats for ſeed	5	5	0
Total	£15	0	0

Add to this, the advantage of having at leaſt half the land in good order for a crop of wheat; which muſt make it appear a beneficial method of culture.

Mr. Cloſe reduced the price of ſetting wheat with a five-pronged frame, to four ſhillings and ten-pence halfpenny per acre.

The potatoes on the oat ſtubble produced forty-five ſacks, of three buſhels each, from the half acre. Sir William Fordyce, in a letter to the London Society, ſpeaks much in favour of the Surinam or cluſtered potatoes, with which he fed his ſaddle-horſes, inſtead of oats; giving them after the rate of a quartern per day each, boiled; upon which quantity they ſupported their work well. He is of opinion, that horſes thus fed, would be leſs ſubject to the greaſe than thoſe fed on oats. Sir William ſays, the quantity of theſe potatoes which he raiſed in lazy beds on the deepeſt clay ground, was ſo great, that he dares not venture to affirm it, unleſs the witneſſes to the facts were preſent. He believes, an acre of land thus cultivated, and the produce applied to the feeding of cattle, would pay better than any crop about London.

Mr. Young is very diffuſe on this ſubject, and gives us the reſult of many experiments made to aſcertain the produce and profit on the culture of the cluſtered potatoes. Theſe are given at great length in the London Society's Tranſactions,* and the reſult is, that Mr. Young found them much more productive than any other kind he tried. They anſwered well as a fallow crop, paying all the expences of preparing the land for wheat, which, by means of this crop was brought into the fineſt order for that grain.

With him they ſucceeded in feeding of hogs, when boiled and mixed with barley-meal, and alſo for horſes. But there is one objection to this kind of potatoes, which I imagine is the cauſe why they are not more generally cultivated; their running ſo into cluſters prevents them from being eaſily waſhed; it is indeed almoſt impoſſible to get the mould from amongſt them, and when boiled, the earth dropping to the bottom of the copper is apt to ſettle there and burn it.

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* Vol. III. p. 30.

Mr. Anderſon ſays, that by diſtilling potatoes, he produced from them a very fine taſted and ardent ſpirit. This uſeful diſcovery farther purſued, ſo as to aſcertain with preciſion the real quantity and quality of the produce, may ſtill increaſe the utility, and open a new field for the culture and conſumption of this excellent root.*

SECTION II.

Of TURNIPS.

PLINY is of opinion, that Turnips ought to be eſteemed next to corn, or at leaſt next to beans; for that, after them, nothing is of greater uſe. They grow, ſays he, for all animals: four-footed beaſts delight in their leaves; men are as well pleaſed with their tender ſhoots in their proper ſeaſon, as with ſprouts; and their roots are ſo great a relief, when there is a ſcarcity of corn, that they are capable of preventing a famine*.

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* Bath Soc. Tranſ.

Mr. Miller is therefore juſtly ſurpriſed, that ſo great an improvement as the ſowing of turnips in the field, for feeding of cattle, ſhould have been ſo long neglected as it was in every part of Europe; ſince it is very plain that this huſbandry was known to the ancients: for Columella, likewiſe, in treating of the different kinds of vegetables which are proper for the field, recommends particularly the cultivating of good ſtore of turnips; becauſe ſuch of them as were not wanted for the table, would be eaten by cattle. Yet it is not many years ſince the raiſing of this plant for cattle has been in general uſe: nor is the right method of cultivating turnips yet ſufficiently known, or at leaſt is not practiſed, in ſome of the diſtant counties of England; for in many, the method of hoeing the plants is not underſtood, ſo that weeds and turnips are ſuffered to grow together, and where the turnips come up thick in patches, they are never thinned; through which neglect they draw up to have long leaves, but never have good roots, which is the principal part of the plant, and therefore ſhould be chiefly attended to.

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* The Philoſophical Tranſactions (No. 90) relate, that in the years 1629 and 1630, when there was a dearth in England, very good white, laſting, and wholeſome bread was made of boiled turnips, mixed with a ſmall quantity of meal. They fermented well, and kneaded kindly together.

It is perhaps more curious than uſeful to obſerve, that in Columella's time, turnips were much eſteemed and cultivated in Gaul for the food of cattle, which were chiefly fed with this root in the winter time. Yet ſtrange as it may appear, I have been informed by Mr. More, Secretary to the Society of Arts, &c. in London, that he has had applications from ſome of the firſt improvers in France for the right turnip-ſeed; as a ſpecies of plants not yet underſtood, or cultivated in that country.

The ſorts of turnips moſt profitably cultivated for the food of cattle, which is our object here, are the red or purple-topped, and the large green-topped. The roots of both of them, which are only varieties of the ſame ſort, will grow to a large ſize; but thoſe of the latter will continue longeſt good; for which reaſon this is generally and juſtly preferred. The red or purple topped turnip is alſo extremely good for ſome time; but its roots become ſtringy much ſooner than thoſe of the green-topped: for which reaſon it is not now ſo much cultivated, as it was formerly.

The green-topped turnips, which are the ſofteſt, and ſweeteſt taſted, grow more above ground, than any other ſort of this plant; and therefore are, beſides being the beſt in other reſpects, the moſt convenient for feeding of cattle. Their long tap-root ſupplies them with ſufficient nouriſhment. But this ſituation renders them very liable to be hurt by froſt in ſevere winters, eſpecially if they are not covered with ſnow; for alternate hard froſts and thaws will make them rot ſooner, than thoſe whoſe fleſh is leſs tender. M. du Hamel has had turnips of this ſort upwards of nine inches diameter, and which weighed above twenty pounds; a proof that they are not totally unknown in France: and Mr. Miller has ſeen ſome boiled, of more than a foot diameter, which were as ſweet and tender as the ſmalleſt roots.

Turnips thrive beſt in a light, ſandy, loamy, and deep ſoil. If it be moiſt, they will grow the better in ſummer, eſpecially in freſh land, where they are always ſweeter than upon an old worn-out ſoil. For them to grow very large, the ground muſt be well prepared, and well manured ſome time before ſowing: for dung laid on them would breed inſects, which would damage the roots, and kill the plants. In Norfolk, a county famous for the culture of turnips, they dung their ground for this plant as much as they poſſibly can. Even Mr. Tull allows the neceſſity of dung in this caſe; becauſe, as turnips have commonly leſs time to grow than other plants, dung and tillage together will effect the neceſſary degree of pulverization, ſooner than plowing can do alone.

The Society of Improvers in Agriculture in Scotland obſerve, that though it be generally thought that the natural ſoil for turnips is a light ſandy ground; yet there ſeems to be no reaſon to object to other ſoils, provided they be cultivated as they ought: for, by an experiment mentioned in the Tranſactions of the Royal Society, (No. 360) it has been found, that on moſs or peat ground, turnips have increaſed by growth, fifteen thouſand nine hundred and ninety times the weight of their ſeeds, each day they ſtood upon it. It is true, that ſmall ſeeds, eſpecially, thrive beſt in a fine mould; and as light ſoils are moſt eaſily made fine, they are thought to be the beſt for them. But why, add thoſe gentlemen, may not clay be made fine enough, by the plough, harrow, and roller? The plowing for turnips, and all tap-rooted plants, ſhould be as deep as poſſible; that their roots may the more eaſily deſcend. Indeed, if deep plowing is neglected, turnips may well thrive better on ſandy grounds than on clay; becauſe the former, though unſtirred, is more penetrable by their roots.

This obſervation of the Edinburgh Society is not only judicious, but extremely uſeful; becauſe it ſhows, what I am convinced is perfectly juſt, that the culture of this very profitable root ought not to be confined to light grounds, but that it may alſo be raiſed to great advantage on heavy ſoils, when they are properly prepared for it.

M. du Hamel had ſurpriſingly large turnips in ground looſened to the depth of three feet: but he does not adviſe going ſo deep, becauſe that would be too expenſive. It proves, however, the advantage of deep plowing.

This plant has alſo ſucceeded perfectly well, when ſowed on ground made mellow by a crop of rank peas, and only harrowed in without plowing.

The common ſeaſon for ſowing of turnips is, from the beginning of June, to the middle of Auguſt, or even a little later; and, if poſſible, juſt before a ſhower of rain.

But the Edinburgh Society ſay, this ſeed ſhould be ſown in a moderate rain, or immediately after it: if the ſeaſon, however, ſhould continue long dry, and the time of ſowing be like to go over, it is adviſed, rather than wait too long, to ſteep the ſeed in ſoft water ten or twelve hours, and to dry it with powdered chalk, and ſow it immediately.*

It is not adviſeable to ſow this ſeed later than Auguſt, becauſe if the autumn ſhould not prove mild, the plants will not have time to apple before winter; nor will the roots of thoſe ſown after the middle of July grow very large, unleſs froſts keep off long in autumn. The ſeed muſt be harrowed in as ſoon as ſown, with a ſhort-tined harrow, and the ground rolled with a wooden roller, to break the clods and ſmooth the ſurface: but the ſeed ſhould not be buried above an inch deep; eſpecially that of the large ſort, which grows almoſt out of the ground. Two pounds of ſeed are full ſufficient for an acre of land ſown broad-caſt: but one pound is the common allowance in that way. Three or four ounces are the uſual quantity to drill.

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* Maxwell's Collection, p. 19.

Turnips ſhould always be ſown on an open ſpot of ground: for if they are near hedges, walls, buildings, or trees, they will draw up, and be very long-topped; but their roots will not grow to any ſize. They are ſown in great quantities in the fields round London; not only for the uſe of the kitchen, but for feeding cattle; and more particularly cows in winter. They have become a vaſt improvement to barren ſandy lands, eſpecially in Norfolk, where many people have doubled, nay, even trebled, the yearly value of their lands, by the culture of this plant.

No ſeed is ſo uncertain as that of turnips; for, frequently the plants riſe only in patches; in which caſe the ſurface of the vacant ſpaces muſt be looſened with a hand-hoe, and freſh ſeed muſt be ſown, and covered over with a rake: at other times, huſbandmen have been obliged to ſow the whole anew, two or three times, before it would take.

The chief expence is indeed the labour, for the ſeed is very cheap: but the ground ſhould always be looſened, eſpecially ſtrong land, either by hoeing or harrowing, before it is ſowed. If all theſe precautions fail, as they ſometimes do, or if the fly, which is a cruel enemy to this plant, has eaten off the young crop, ſo as to render it not worth the farmer's while to let the remainder ſtand; M. du Hamel adviſes plowing up the field and ſowing it with vetches for green fodder; or leaving it till autumn; then to give it a plowing, and ſow it with wheat.

Mr. Liſle is of opinion that the beſt way to manage turnips is, firſt to harrow the ground fine, after it has been brought to a perfect tilth by plowing, then to roll it, ſo as to break the ſmall clods, if any ſuch remain, and let it lie thus till next rain; then, the ground being mellow, to ſow the ſeed, and harrow it with ſhort-tined harrows, which may not open the ground too deep, or bury the ſeed; then roll it again, in order to keep the moiſture in the ground; this will make the ſeed ſooner ſtrike root, which may be in forty-eight hours: yet the ſurface muſt be ſo fine, and ſo lightly compreſſed, that the ſeed may ſprout though it. He thinks the ſucceſs, or miſcarriage, of a crop of turnips, conſiſts in theſe four things; firſt, in the ſeed's not lying too deep; ſecondly, in its not lying too wet; thirdly, in its not lying too dry; and fourthly, in its lying in a fine bed.

If the ſeed grows, the plants will appear in a few days, when the ſeaſon is moiſt; but in dry weather they will be longer in coming up: and then it is that they will be in moſt danger of being devoured by the fly. When the plants have got four or five leaves, they ſhould be hoed, to deſtroy the weeds, and to thin thoſe which grow too cloſe together; leaving the remaining ones ſix or eight inches aſunder, which will be ſufficient room to give them the firſt time; but in the ſecond hoeing, which ſhould be done three weeks or a month after the firſt, eſpecially if the ground be ſubject to weeds, the turnips, which will then be about the ſize of common apples, ſhould be cut up; ſo that the remaining plants be left fourteen or ſixteen inches from each other, or even more; eſpecially if they are deſigned for feeding of cattle: for where the roots are allowed a good ſpace to grow in, they will be proportionably large; and thus, what is loſt in number, is more than repaid by the increaſe of bulk. But in places where they are ſown for the uſe of the kitchen, they need not be left at a greater diſtance than ten inches or a foot, becauſe very large roots are not generally eſteemed for the table.

Inſtead of the firſt hoeing, M. du Hamel recommends a ſlight plowing all over the field, with a chiſſel-ſhared plough that has no fins. I approve much of this plan, as being both a cheaper and ſpeedier way to thin the plants. After theſe two hoeings, the turnips will require no further care.

They will have attained their full ſize in October, before the froſts come on; and ſhould then be taken up, ſtripped of their leaves, which may be given to cattle, and laid upon hurdles in a dry place, with a layer of dry ſand between each layer of turnips; and thus piled up, they will keep well for the food of cattle during the winter.

Some ſow turnips on their hemp and flax grounds, when they pull up thoſe plants; and the ſeed is pretty well covered by the ſtirring thus given to the earth. Others give their corn-ſtubble only a ſlight plowing, after harveſt, then ſow the turnips very thin, and harrow in the ſeed. Theſe methods do very well when the ground is in good tilth. Others again, ſow late turnips, merely for the ſake of their leaves, which they uſe as green feed, when they are about a foot high; and in this caſe they ſow the ſeed very thick.

An eaſy way to have two growths of turnips in the ſame field is, to ſow ſeed of the laſt gathering, and ſeed of the former year; for the latter is longer of riſing than the new ſeed; and the turnips, by riſing at different times, have a double chance of eſcaping the fly, or grub; which ſometimes deſtroy them intirely: for it has been obſerved, that theſe flies often come ſuddenly in great ſwarms, and eat up the turnips as faſt as they riſe; and that they ſometimes diſappear as ſuddenly; ſo that the turnips which riſe a few days after in a neighbouring field, are not at all injured by them: conſequently, when the turnips of the ſame field riſe at different times, one or other may eſcape the ravages of theſe baneful inſects; for they deſtroy them only while in their ſeed leaf. The danger is over, when they have put out their rough leaves pretty ſtrong, as they will in a few days, if rain falls when they firſt come up. Dry weather at that time is therefore dangerous to them.

One of the many ways recommended to guard againſt theſe inſects is, to run a heavy roller over the whole field, if ſown broad-caſt: or acroſs the rows, if the turnips have been drilled. This rolling hardens the ſurface of the earth, ſo that they can neither get in or out; by which means they are deſtroyed. But this preſſure of the earth will be very hurtful to the plants, if the ground has not been deeply plowed, if it be moiſt, or if it be ſtiff, and apt to bind. Theſe inconveniencies are, indeed, partly remedied in the new culture, by hoeing the alleys as ſoon as the turnips have put forth their large leaves; for then they are out of danger from the inſects, which the hoeing alſo helps to deſtroy. The horſe-hoe is the only inſtrument with which this work can be well done; the earth being often ſo hard, that the hand-hoe would only ſcratch it.

The fly which preys upon turnips is not unlike the weevil in corn: it is nearly of the ſame ſhape, and has alſo hard wings.

Of the many boaſted recipes for preſerving turnips from the fly, few deſerve any notice. I will therefore mention only thoſe which ſeem to me beſt vouched. Mr. Miller recommends ſteeping the ſeeds in water mixed with ſo much flour of brimſtone, as to make it ſtrong of the ſulphur. Another way is, ſteeping it in water mixed with a quantity of the juice of horſe-aloes. The ſowing of ſoot, or tobacco-duſt, over the young plants, as ſoon as they appear above ground, has alſo been found very ſerviceable: and this may be eaſily done along the ſurface of each drill, if the turnips are cultivated according to the new huſbandry. Another recipe is to ſteep the ſeed in chamber-lye ſix hours, then drain off the liquor, and ſtrew the ſeeds with as much flower of brimſtone, or ſulphur vivum, as will render them dry enough to ſeparate and ſow in the uſual manner.

But that which appears to me to promiſe moſt ſucceſs is a remedy mentioned in the Tranſactions of the Bath Society, viz. that the bows of the commen elder tree, fixed in a gate or hurdle, and drawn gently over young turnips when they firſt appear, will prove an excellent preſervative from the fly; and if the leaves of the boughs be a little bruiſed, and fumigated with the ſmoke of burnt tobacco mixed with a ſmall quantity of aſſafœtida, it will effectually deſtroy thoſe inſects: for nothing is more diſagreeable to inſects, than a mixture of tobacco and aſſafœtida fumigations. It will kill them inſtantly wherever applied.*

In the ſame Tranſactions, is ſubjoined the following direction upon this ſubject. After the land has been plowed for turnips, and when the ſeed is harrowing in, let ſome large branches of common elder, with the berries on, be fixed in the harrow, ſo as to rub on the ground. The friction of the leaves and berries will leave ſo ſtrong (and to theſe inſects, ſo diſagreeable) a taint or odour on the ſoil, as will prevent their alighting on ſo unpleaſing a ſpot, or make them ſpeedily leave it, if they can be ſuppoſed to have been there, before the ſeed was ſown. The effects of the effluvia of elder are much greater, and more laſting, with reſpect to thoſe inſects, than would at firſt be imagined, or even credited by the bulk of mankind.*

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* Bath Soc. Tranſ. Vol. I. p. 96.

It is by no means improbable, but that this ſame application may be a very powerful preventive of the evil which I am now going to mention.

The caterpillar, another bitter enemy to this plant: which it very often attacks, even when it is grown ſo large as to have ſix or eight leaves. The ſureſt way of deſtroying theſe inſects is to turn a ſufficient number of hungry poultry into the field, early in the morning: they will ſoon devour the inſects and clear the turnips. Thoſe that are ſown in drills, are leaſt expoſed to this evil; becauſe the frequent ſtirring of the ground between the rows, keeps the plants conſtantly growing in great vigour, and they are therefore leſs injured by thoſe inſects.

The worm, to which turnips are very liable, may be guarded againſt, in a great meaſure, by liming the ground.

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* Bath Soc. Tranſ. Vol. I. p. 96.

This will alſo render them much ſweeter than they would otherwiſe be. It is to the worm lodged in the root of the turnip, that Mr. Liſle imputes the diſeaſe which is called hanbery by the Norfolk Farmers, and ſo named from a like diſtemper in the heels of horſes. It is a warty excreſcence, formed probably by this inſect, as galls are formed on the leaves of oaks. In ſome years, it takes off whole crops, and turnips never thrive when they begin to grow in them.

The following experiment was tried with ſucceſs, to preſerve turnips from the fly, and the better to ſecure their growth. The ſeed was ſowed in a nurſery; where there was leaſt danger of ſlugs or the fly, and where they might be eaſily watered in caſe of great drought. Here they remained till they were large enough to be tranſplanted.

Some weeks were thus gained to perfect a fallow, or give a thorough plowing to ground, which had borne a crop that ſeaſon. The turnips being tranſplanted into the field, were regularly placed, and at proper diſtances, which greatly leſſened the expence of hoeing, the weeds being eaſily deſtroyed as they appeared. If the ſeaſon be dry, they may be carried from the nurſery to the field in veſſels filled with earth moiſtened till it becomes as thin as gruel, as is alſo done in tranſplanting of lucerne.

The chief uſe of turnips is, to feed cattle in the winter and ſpring, when there is a want of graſs for their paſture. Cows, oxen, and hogs, are very fond of this food, which fattens them, and increaſes the milk of the former. This has made the demand for it by the cow-keepers round London ſo extremely great.

Sheep too eat it readily, and thrive upon it when they have been uſed to it early; but they do not reliſh it, when it has not been offered them before they are grown old: however, if they are kept faſting two or three days, moſt of them take to it, and when they have once taſted it, they become very fond of, and feed kindly upon it. In ſome places they feed their lambs with turnips till the middle of April, though they then begin to run up to feed. Farmers chooſe rather to do this, than to let them hurt their clover, ſain-foin, lucerne, &c. Some par-boil them a little at firſt, till their cattle, and particularly their ſheep, are accuſtomed to them; but a lamb only three weeks old will, after it has once eaten of this food, ſcoop out a raw turnip with great glee.

If turnips are not eaten clean, and well cleared off the ground, they may take root again, run to ſeed, and do great damage to the enſuing crop.

The practice of turning a flock of ſheep at random into a large field of turnips, is very bad; for they will then ſpoil more in a fortnight, than would keep them a whole winter. The beſt way, therefore, of feeding them with theſe roots is, as Mr. Tull adviſes, and after him M. du Hamel; one or other of the three following methods; which are equally applicable to the drill, or to the common huſbandry.

The firſt is, to portion out the turnip ground, by incloſing with hurdles, ſo much only as the ſheep can clear in one day; and ſo to advance the folds further into the field every morning, until all be ſpent. But it is to be obſerved, that the ſheep never eat them clean this way; but take only the leaves and the heart of the turnip: ſo that great part of them remains in the earth. It is true that theſe fragments, if left there, rot, and become a manure: but when they are wanted for the food of the flock, we regret ſeeing ſo large a proportion ſerving only for manure.

The ſecond method differs from the former, in pulling up the turnips, ſo far as they have been hurdled off, before the ſheep are turned in. They then eat them cleaner up, being more eaſily come at; nor is this attended with near ſo much waſte, as in the other way. The turnips which grow next the hurdles, ſhould be thrown towards the middle of the ſpace hurdled off; becauſe they will be leſs liable to be trampled upon and ſpoilt there, than nearer to the hurdles, where the ſheep run about moſt, in ſearch of the means of eſcaping into the open field.

The third way is, to pull up the turnips and carry them into ſome other ground, and there ſpread them every day on a new place, when the ſheep will eat them up clean. This is done when there is land not far off, which has more need of dung than that where the turnips grew. The expence of carrying the turnips is compenſated by ſaving the price, or at leaſt the carriage and removal of the hurdles: only when the turnips are laid on a ſpot of graſs in wet weather, the benefit of the dung and urine of the ſheep, are, in a manner, loſt.

This method is neceſſary, when the field upon which the turnips grew is wet; becauſe, firſt, the ſheep would trample upon them, and bury part of the turnips; which would be waſted. Secondly, in treading that wet land, they would poach it, and render it unfit for corn. And thirdly, a field may thus be dunged, which wants it more than where the turnips grew.

Turnips are always carried off the field when they are intended to fatten the larger ſorts of cattle, and it is beſt that they be cut into pieces for them, leſt they choak themſelves, of which they are moſt in danger from thoſe of a middling ſize. They are given morning and evening to ſtall-fed cattle, which, in the intervals eat common fodder: but turnips increaſe their appetite to ſuch a degree, that a middle ſized bullock will conſume near two hundred pounds weight of theſe roots in twenty-four hours, beſides hay; whereas, if hay only were given him, he would hardly eat half that quantity. A healthy bullock in tolerable good plight, when ſtalled, will be well fattened with turnips in three months.

But if ſalt is given them along with the turnips, it will ſave at leaſt a fortnight of that time; and I am aſſured, that if the turnips are thrown into an oven and baked for ſome time, they will fatten cattle much ſooner than when raw; as is the caſe alſo with potatoes.

In Norfolk, and ſome other counties, great quantities of turnips are cultivated for feeding of black cattle, which turns to good account. The turnips are taken off the ground before the land is wetted by the winter's rains, and are laid up in barns; where they keep perfectly well. By feeding cattle thus, the farmer obtains a good dreſſing for his land.

Some intelligent farmers have cultivated turnips by ſowing them in rows, with a drill plough.

The diſtance between the rows has been different, ſome having placed them at two feet, two feet and a half, three, four, and even five feet aſunder; and ſome have ſown ſingle, and others double rows. For my own part I would recommend ſingle rows, at about two feet diſtance, and am convinced, that the produce from an acre of land ſown in this manner, and properly horſe-hoed, will be much greater, than from the ſame extent of ground ſown broad-caſt, and only hand-hoed.

The Lord Viſcount Townſhend, was at the pains of making a comparative trial of thoſe two different modes of huſbandry; which he did with great care, by dividing the field equally into different lands, which were ſown alternately in drills and in broadcaſt. The latter were hoed by hand, and the former were horſe-hoed.

When the roots were full grown, his Lordſhip ordered an equal quantity of land, cultivated in each way, to be meaſured off, the turnips to be drawn, and the produce weighed.

The reſult was, that thoſe cultivated with the horſe-hoe were ſo much larger than the others, that the crop of one acre out-weighed the other by a ton and a half.

Mr. Tull recommends, from experience, ſingle rows ſix feet aſunder. He alſo tried double rows, at the ſame diſtance. He likewiſe ſowed them in ſingle rows three feet aſunder. Theſe laſt yielded a greater crop, than a neighbouring field, which was ſown and managed in the common way: but neither the ſingle rows three feet apart, nor the double rows ſix feet aſunder, yielded half ſo much as the ſingle rows ſix feet apart: from whence he concludes, that it is beſt to leave a ſpace of ſix feet between the rows; for that, if the intervals are well plowed, theſe turnips will thrive wonderfully, even though no other moiſture falls than the dew, which will ſink in the earth, to their roots.

If theſe large intervals are intended to be drill-ſown with wheat in the autumn, I cannot ſee any great objection to having them ſo wide; for in fact, it is only having a greater portion of the field prepared for wheat by a ſummer-fallow; but if the object were the turnips alone, I cannot help being of opinion, that they may be equally well cultivated with intervals of three feet as with thoſe of ſix.

An ounce of ſeed will ſow as much land when drilled, as a pound will in the common way; and if care be taken to diſtribute only the neceſſary quantity, much trouble will be ſaved in hoeing and thinning the plants. But this is not an univerſal opinion, for ſome perſons recommend ſowing four pounds per acre, by which means they make a large allowance for the depredations of the fly, and alſo for a ſufficient quantity to come up.

It is perhaps unneceſſary that I ſhould again repeat, that all roots, whether potatoes, turnips, carrots, parſneps, parſley, &c. require a greater depth of ſoil than corn, and thrive beſt where the mould is light, fine, and well looſened. M. du Hamel trenched the whole of his kitchen-garden three feet deep; all his pot-herbs grew very fine, and his roots in particular, were of a ſurprizing ſize.

Mr. Tull, by drilling his turnip-ſeed alternately, at different depths in the earth, was ſure to ſucceed in one part or other, whether the ſeaſon was wet or dry. If wet, the ſeed lightly covered ſprouted firſt; and in dry ſeaſons, that which lay deepeſt was the firſt to riſe. By which means, and by mixing the ſeed, half new and half old, for the new always comes up ſooneſt by a day, he had like four different comings up; and thus gave the turnips ſo many chances to eſcape the fly.

If we were ſure of having rain immediately after the turnips are ſown, it would undoubtedly be right to ſow them very ſhallow: but if no rain happens, they are beſt deeper in the earth; becauſe they there meet with moiſture ſufficient to make them grow.

When the ſeaſon has been ſo kindly, that all the ſeeds have grown, and the plants have not ſuffered by the fly, or other inſects; they muſt be thinned early, that the ground may not be exhauſted by thoſe that are intended to remain, and what are left ſhould be from one foot to ſixteen inches aſunder.

When the turnips ſown in drills thrive well, only each alternate alley need be hoed at one time, and the other a few days after; it being better to feed the plants gradually, by dividing the hoeings in this manner, than to give them a great deal of food at once, by hoeing all the alleys together, and leaving them afterwards, double the time without any culture whatever. Another advantage attending this method is, that the plants will be leſs liable to be killed by hot dry weather, and leſs apt to be damaged by heavy rains. Care will however be required, to extirpate the weeds as they riſe.

An expert huſbandman will bring the horſe-hoe to within two or three inches of the plants: but the remaining ground where the rows ſtand ſhould be hand-hoed, and looſened, ſo as to give room for the fine fibres of the roots to ſtrike out into the intervals: otherwiſe, if the land be ſtrong, it will become ſo hard in thoſe places which are not ſtirred, as to ſtunt the growth of the turnips. This may be done at a ſmall expence and in very little time, as the horſe-hoe has before ſtirred all the reſt of the ground,

All plants ſown in ſingle rows are greatly benefited by this alternate hoeing of the alleys between them: for, as M. du Hamel obſerves, four of theſe hoeings, which coſt no more than two entire ones, are almoſt as beneficial to the plants; for a plant which finds a great deal of nouriſhment on one ſide, is better able to thrive, without receiving ſo much on the other; and if in hoeing very near the plant ſome of its roots are broken, thoſe on the other ſide, not hoed, ſupply the wants of the plant, till the broken ones have made freſh ſhoots. The horſe-hoe may therefore be brought very near to the turnips, without danger of hurting them; provided it does not force them out of the earth: and when a farmer has a great quantity of turnips to hoe, they are ſooner aſſiſted by this culture, than if all the alleys were to be hoed at once.

When theſe plants are grown large, and their roots are, conſequently, pretty well extended; the hoe-plough need not come quite ſo near them as at firſt: nor is it neceſſary to hoe them at all, till they are about the bigneſs of one's finger.

One alternate hoeing, or, which is the ſame thing, two half-hoeings, will be ſufficient when the turnips are ſown late: but when they are ſown early, and many weeds grow, one hoeing will not be enough.

By followiug this culture, M. du Hamel had turnips which weighed from ſixteen to nineteen pounds; and we may depend on their being twelve pounds a piece averagely in a good ſoil; which is a vaſt produce from an acre of land. Mr. Miller alleges, that one acre of turnips, thus cultivated, will afford more feed for ſheep or ewes in the winter, than fifty acres of the beſt paſture at that ſeaſon.

Another great advantage which attends the ſowing of turnips in rows is, that it gives the beſt and faireſt opportunity of promoting the alternate huſbandry of which I have already ſaid ſo much. For in this way, rows of wheat may be drilled or ſet between the turnips; or beans may be ſet, or winter tares may be drilled. The alleys or intervals, hoed as above directed, will be in the beſt order for receiving the ſeed; and care only will be required in pulling up the roots, ſo as not to injure the riſing plants. This done, the ſpaces where the turnips grew, become the alleys between the beds of corn, or pulſe; and may now, in their turn be horſe-hoed or hand-hoed, whichever can be moſt conveniently accompliſhed.

The beſt turnip-ſeeds are obtained from the largeſt roots, which may either be tranſplanted for that purpoſe, or marked out in the field where they were ſown. Thoſe which are commonly ſold in the ſhops, ſeldom produce the fineſt plants.

In Norfolk, Suffolk, and in this county, turnips ſown in the common way are always twice, and often three times, hand-hoed with a nine-inch hoe. This work requires conſiderable dexterity, as the plants that are not to be cut up, ſhould be left regularly at a foot diſtance from each other, and the hoeing muſt be begun before the plants are too forward. A farmer who is not uſed to this practice, and ſees the withered plants the day after hoeing, will think his whole crop entirely deſtroyed; whereas, by this proceſs, they will come to twelve, and even eighteen or twenty pounds weight, without their leaves. But, in order to have them of this weight, the land muſt be well manured, and agriculture muſt be well underſtood.

The uſual courſe of crops amongſt the beſt farmers in Norfolk, is firſt, turnips; ſecond, barley; third, clover, or clover and rye-graſs; fourth, wheat. This courſe has of late become very general, and keeps the ſoil clean. They manure, if poſſible, for turnips; and alſo for wheat. Every thing depends on the ſucceſs of their turnips, and the ſucceſs of theſe depends on good hoeing. The are their only fallow in the uſual courſe; nor can they change them for a mere fallow, becauſe the ſheep kept to fold, and feed off the clover and rye-graſs, would then ſtarve. When they give four plowings for turnips, and hoe them well twice, they often prove worth five guineas an acre. The principal part of the crop is drawn, and carried into farm-yards, for fattening beaſts; the remainder is fed off with ſheep and lambs, which clear the land of every part of them. The winter food of cows in farm-yards is chiefly turnips, and ſtraw*.

To prepare the land for turnips, ſays a Suffolk farmer, it ſhould be ſummer-tilled: turn in the wheat-ſtubble about December to a moderate depth, and let it reſt till the March following: harrow it well; and then turn it in ſomewhat deeper, below the firſt plowing; the deeper the better; for turnips thrive beſt where there is plenty of mould. In May, repeat the harrowing, and turn it up with a fine rift-balk. After it has taken the benefit of the ſun, harrow it down. Manure it with twelve loads of ſhort dung, or eighteen of long dung per acre. At Midſummer, plow the dung in a good depth, with a narrow ſurrow, and ſow the ſeed cloſe after the plough. Sow from one pint and a half to two pints and a half per acre, as the ſeaſon, or quality of the land may require. In a month, the plants will be fit to hoe. When they nearly cover the land, hoe them a ſecond time, with a ſeven or nine-inch hoe, and leave the plants fourteen inches aſunder. The price of hoeing, in Suffolk, is generally four ſhillings and four pence per acre, the firſt time; and two ſhillings and two pence the ſecond time. A good crop will produce from thirty to forty cart loads per acre; which for many years' paſt have ſold at from three pounds to four pounds per acre.

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* Bath Soc. Tranſ. Vol. I. p. 21.

Whenever I feel my ſubject of real importance, I give way to diſcuſſion; but when of leſs utility, I ſhall ever make brevity my particular aim. I conſider the culture of turnips as a point ſo very eſſential in all good huſbandry, that I hope I ſhall be excuſed for dwelling at ſome length upon a topic ſo intereſting.

What follows is a communication to the Society at Bath, from a gentleman farmer near Ipſwich. In November they plow in their wheat ſtubbles, and give the land four plowings after, at ſuch times as ſuit their convenience. Previous to the laſt plowing, which ſhould be in the latter end of June, they cart on twenty loads (or as much as three horſes can draw), of rotten dung, or mulch, from the farm yard, turned up in April, or early in May. Sometimes, as lime is the readieſt and cheapeſt manure in theſe parts, it is uſed inſtead of dung: but the latter is thought preferable. One quart of turnip-ſeed is ſufficient for an acre. New ſeed will come up three days ſooner than old. What is plowed for the laſt earth, ſhould be ſowed the ſame day; elſe, unleſs rain falls, the ground will be too dry for the ſeed to vegetate. When the turnips are within three days of being fit for hoeing, if the weather be dry, they run a pair of light harrows over the field, in a direction contrary to that of ſowing, and before they are hoed the firſt time. This is found to be of much ſervice. The turnips ſhould be hoed twice with a ſeven-inch hoe, and ſet out at a foot from plant to plant; fifteen or ſixteen inches is ſtill better. The labourers, who by uſe, become very expert, have three ſhillings and ſix pence per acre for the firſt hoeing, and two and ſix pence for the ſecond with ſmall beer.

Crops vary according to the quality of the land; from forty ſhillings to three pounds per acre in value, and are moſtly fed off in the field.

In feeding them, it is cuſtomary firſt to draw off a rod in width round the field. This is done to prevent the cattle from ſpoiling them, by getting near the hedges for ſhelter in bad weather. The farmer firſt puts in his beaſts, then his beſt wether ſheep, and laſtly his lambs, which eat up all the refuſe left by the others.*

The method of turning in beaſts before ſheep intended to be fattened, is certainly not commendable. Neither will the beaſts which are allowed to run about, fatten near ſo ſoon as thoſe that are ſtalled.

It is only on light ſoils that they can, with any propriety, be fed off with ſtock in the field where they grow. In heavy wet lands, they are drawn and carried off in light carts, either to be eaten in ſome graſs, or unplowed ſtubble field, or in the houſes and yards at home.

This laſt method is preferred by the moſt judicious farmers, even where the lightneſs of their ſoils would well admit of feeding them where they grow. Their reaſons are, that there is thus no waſte of the turnips; that the food comes equally freſh to the beaſts every day; that the protection from cold and wet weather, which the cattle enjoy in houſes, or well fenced and ſhedded yards, contributes much more than is generally imagined, to their health and fattening: and that by means of this, all their dung is collected and preſerved, to be laid on ſuch fields, and at ſuch times as will be moſt beneficial to the enſuing crops. Theſe advantages are loſt by the method of feeding them in the field; for even the dung of the beaſts is generally dropped under the hedges or trees, to which, after filling themſelves, they fly for ſhelter and warmth.

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* Bath Soc. Tranſ. Vol. I. p. 137.

The expence of carting away an acre of turnips depends on the goodneſs of the crop, and is from ten to fifteen ſhillings: which, although it is much more than ſaved in preventing the turnips from waſte, yet inclines the covetous and indolent to feed them off the land; for they flatter themſelves they have no waſte, while they have lean ſheep or bullocks which will eat up the offal which the fat ones have left; not conſidering how much better their ſecond or lean ſtock would thrive with freſh and clean food*.

Turnips do well on every kind of ſoil with good and repeated plowings, and proper manure; but the beſt for them is a ſandy loam.

They may be effectually preſerved from the fly, if, as ſoon as the ſeed-leaf appears, wood aſhes be thrown over them, as often as it is waſhed off by dews and rain.

Turnips are always employed as a fallow crop; after which barley is commonly ſown, then clover, and next wheat. The fifth may be oats, the ſixth clover and rye-graſs, the ſeventh peas, and the eighth barley.

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* Bath Soc. Tranſ. Vol. II. p. 95.

I have already given the opinions and practice of the ſkilful, reſpecting the beſt method of preventing the depredations of the fly in turnips. I muſt not however omit to mention one more, communicated by a gentleman farmer at Drayton, in Norfolk, to the Bath Society*, of which, he ſays, he has had three years experience, after having diſcovered it by accident.

A neighbouring farmer not having a ſufficient quantity of manure for all his turnip land, was under the neceſſity of ſowing four acres unmanured. The effect was, that the turnips on the part manured were moſtly eaten off by the fly, while the four acres unmanured eſcaped without injury.

The Bath Society's correſpondent determined to make ſome experiments from the above hint; and accordingly manured five acres well for turnips, and tilled three acres and a half in the uſual way, without any manure. Thoſe which were manured, were almoſt univerſally deſtroyed by the fly; inſomuch that it was neceſſary to ſow the land over again. The three acres and a half which had no manure, were intirely free from any injury. It is however proper to obſerve, that when theſe laſt were drawn, they were not near ſo large as the former.

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* Bath Soc. Tranſ. Vol. II. p. 235.

Not ſatisfied with this trial, he determined to make another. He therefore manured ſix acres of wheat ſtubble, which he intended for turnips the following ſeaſon. This done, he immediately plowed it, leaving it to incorporate freely with the earth till the following ſummer; which had the deſired effect: for the turnips which grew upon it, were as large as thoſe upon the land which was manured at ſeed time. The two ſucceeding years, this experiment was repeated, with equal ſucceſs. Hence he infers, that the fly was either ingendered in the new dung, or inticed by it. But when this manure is laid in the preceeding autumn, it loſes all its noxious qualities, and retains all its nutritive ones.

Another material advantage accruing from autumnal manuring turnip-ground is, that all the ſeeds contained in the manure, and which of courſe are carried on the land with it, vegetate almoſt immediately, are moſtly killed by the ſeverity of the winter; and what eſcapes the winter, periſhes in the future plowings.

There is certainly a great deal of good ſenſe in what this gentleman propoſes, and ought therefore to be repeatedly tried in all ſoils and ſituations.

Our next care with reſpect to turnips is, to ſecure them from froſts; which when ſevere, it is impoſſible to do, unleſs by previouſly drawing and houſing them. The expence and trouble of this would be very great in extenſive culture, and could only pay in very hard ſeaſons.

The beſt method of preſerving them, that I have heard of, and which has been tried with ſucceſs by ſome of our moſt intelligent farmers is, to ſtack them up in dry ſtraw; for they will not keep in ſand, like potatoes, carrots, or parſneps. A load of ſtraw is ſufficient to preſerve forty tons of turnips, and it may be thus performed. After drawing your turnips in February, cut off the tops and tap-roots (which may be given to ſheep or hogs), and let them lie a few days in the field; as no weather will then hurt them. Then, on a layer of ſtraw next the ground, place a layer of turnips two feet thick; and then a layer of ſtraw; and ſo alternately, till you have brought the heap to a point. Care muſt be taken to turn up the edges of the layers of ſtraw, to prevent the turnips from rolling out; cover the top well with long ſtraw, and it will ſerve as a thatch for the whole.

In this way, as the ſtraw imbibes the moiſture exhaled from the roots, all vegetation will be prevented, and the turnips will be nearly as good in May, as when firſt drawn from the field. If ſtraw be ſcarce, old haulm or ſtubble will anſwer the ſame purpoſe.

But to prevent this trouble and expence, perhaps farmers, in all counties, would find it moſt to their intereſt to adopt the method of the Norfolk farmers, which is to continue ſucceſſively ſowing turnips till the latter end of Auguſt; by which means their late crops remain good in the field, till the latter end of April, and often till the middle of May. The advantage of having turnips good till the ſpring feed is generally ready, are ſo obvious and ſo great, that this practice is extending itſelf to the adjacent counties.*

In cultivating turnips to advantage, ſays another correſpondent of the Bath Society, great care ſhould be taken to procure good, bright, nimble, and well dried ſeed, and of the beſt kinds.

The Norfolk farmers generally raiſe the oval white, the large green-topped, and the red or purple topped kinds, which, from long experience, they have found to be moſt profitable.

The roots of the green-topped will grow to a large ſize, and continue good much longer than the others. The red or purple topped, will alſo grow large, and continue good to the beginning of February; but the roots become hard and ſtringy ſooner than the former. The green-topped, growing more above ground, is in more danger of ſuſtaining injury from ſevere froſts, than the red or purple, which are more than half covered by the ſoil; but it is the ſofteſt and ſweeteſt of any kind, when grown large. Theſe have been brought to table a foot in diameter, and equally as good as garden turnips.

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* Bath Soc. Tranſ. Vol. II. p. 293.

Turnips, continues he, delight in a light ſoil, conſiſting of ſand and loam mixed; for when the ſoil is rich and heavy, although the crop may be as great in weight, they will be rank, and run to flower earlier in the ſpring.

Turnip-ſeed, like grain, will not do well without frequent changing. The Norfolk ſeed is ſent to moſt parts of the kingdom; but after a few years it degenerates: ſo that thoſe who wiſh to have it in perfection, ſhould procure it freſh every year from Norwich; and they will find their account in ſo doing; for from its known reputation, many of the London ſeedſmen ſell, under that character, ſeed raiſed in the vicinity of the metropolis; which is much inferior in quality.

The great riſk in ſowing turnips is, their being eaten off by the fly, eſpecially in a dry ſeaſon. This is an evil, for which no effectual remedy has yet been diſcovered. The following, however, have often proved of ſervice: a ſmall quantity of ſoot ſown over the land, at their firſt appearance. Branches of elder, with their leaves bruiſed, drawn over them in a gate or hurdle. Muſk mixed with the ſeed before it is ſown. And ſulphur burnt under it, after moiſtening it in water in which tobacco has been ſteeped. But ſhowers on the plants, as ſoon as they appear above ground, are the beſt preſervatives. They enfeeble and kill the fly; and haſten the plants into the rough leaf, in which ſtate they are out of danger.

Some of the beſt Norfolk farmers ſow turnips in drills, three feet aſunder; and at a ſecond hoeing, leave them a foot apart in the rows. Thus, the trouble and expence of hoeing is much leſſened, and the crop of equal weight as when ſown in the common method. The intervals may eaſily be cleared of weeds by the horſe-hoe.

An acre of land contains forty-three thouſand five hundred and ſixty ſquare feet; ſuppoſe every foot contains a turnip of two pounds weight averagely, there will be an excellent maſs of food, of thirty-nine tons per acre, worth from four to five guineas, and ſometimes more. Extraordinary crops of barley frequently ſucceed turnips; eſpecially when fed off the land. In feeding them off, the cattle ſhould not be ſuffered to run over too much of the ground at a time; for, in that caſe, they will tread down and ſpoil twice as many roots as they will eat. It is beſt to confine them by hurdles to as much as is ſufficient for them in one day. By this mode, the crop is eaten clean, the ſoil is equally trodden, which, if light, is of much ſervice, and is equally manured by the cattle.

A notion remains in many places, that mutton fattened by turnips is thereby rendered rank, and ill taſted; but this, ſays the Norfolk correſpondent, is a vulgar error. The beſt mutton in that county, and few counties, adds he, have better, is all fed with turnips. It is rank paſtures, and marſhy lands, that produce rank mutton*.

The queſtion however is, whether this letter-writer be really a good judge of well-taſted mutton. I muſt confeſs myſelf to be ſo vulgar, as to prefer that fed on downs, to what is fattened on turnips; but this by no means diminiſhes the utility of turnips properly uſed.

Mr. Winter, whom I have already quoted, ſent to the London Society the following recipe, for preventing the depredations of the fly on young turnips, which ſeems to have been the reſult of very numerous experiments made for this purpoſe, and ought therefore to be attended to. Steep turnip-ſeed twenty-four hours, or more, in a ſufficient quantity of train, or linſeed oil. Take a fine ſieve, or linen-bag, drain the oil from the ſeed, which mix with a quantity of good earth finely ſifted; immediately drill, or ſow. When the plants begin to appear on the ſurface, let the ground be ſowed with ſoot, from eight to ſixteen buſhels per acre*.

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* Bath Soc. Tranſ. Vol. II. p. 373.

Mr. Arbuthnot has given us an account of his experiments upon drilled turnips; which, like thoſe on barley, and peas, are not very favourable. We do not however expect great profit from turnips, which are generally intended as a fallow crop. From this gentleman we however learn two things of conſequence; viz. That rows two feet aſunder will admit of ſufficient culture, with the horſe-hoe, and produce larger crops than at three feet aſunder: and, that having tried various recipes to deſtroy the fly, none had anſwered, except the following.

He collects all ſorts of green weeds from hedges, hedge-rows, &c. mixes them with ſtraw, and lays them in heaps on the windward ſide of the field: they are then ſet on fire, ſo that the wind may blow the ſmoke over the whole field. The weeds muſt not be too much withered, as it is the ſmothering of the flame which produces the ſmoak. This drives away the fly at once, and ſaves the crop: he preſerved ten acres by this method, on which the fly had begun: they were ſafe in three or four days.

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* Lond. Soc. Tranſ. Vol. V. p. 40.

He values the feeding of ſheep on this root, at two-pence a head per week.

But of late, I find a new ſyſtem reſpecting the deſtruction of turnips, adopted by Mr. Henry Vagg, of Chilcompton, who has diſcovered from experience, and repeated obſervations, that the fly is not that formidable foe to the turnip as has all along been imagined. He confeſſes indeed, that by that ſmall inſect punctures are made in the leaves when young, which hurt the growth, and injure the plant; but that its great enemy is the white ſlug, of about one inch long, which attacks it in the night, and diſappears at day-light. To prevent the miſchief which may be done by this pernicious inſect, Mr. Vagg recommends to roll the turnip field with a barley-roller, of eighteen or twenty inches diameter, in the night-time, as ſoon as the ſeed-leaf appears, and a ſecond time in two or three nights thereafter, unleſs the turnips become very vigorous, and remain unhurt; in which caſe, the ſecond rolling may be omitted. Mr. Vagg ſays, that the number of dead ſlugs to be ſeen on the field after ſuch an operation is incredible, and may, I am perſuaded, not only ſave the turnips, but ſerve as a ſmall dreſſing to the field.

Mr. Vagg ſays farther, that he once ſaved a crop of wheat by the ſame method, and recommends it ſtrongly, not only for wheat, but alſo for flax, cabbages, and Dutch clover.

A practice ſo ſimple, and ſo ſtrongly recommended from experience, ought ſurely to be tried by every diligent huſbandman.

SECTION III.

Of Carrots, Parſneps, Parſley, and Shirrets.

I CLASS theſe together, becauſe their culture is alike.

The Flemings have long known the advantage of feeding their horſes and other cattle with carrots. It is not, however, many years, that that root has been cultivated for this purpoſe in England: nor does this uſeful, and profitable practice extend even now to more than a few parts of this country; though there is ſcarce any root yet known, which is more heartening food for moſt ſorts of animals, or which better deſerves the huſbandman's attention.

Mr. Miller, in ſpeaking of this root, alleges, that one acre of carrots, well planted, will fatten a greater number of ſheep, or bullocks, than three acres of turnips; and that their fleſh will be firmer and better taſted. This laſt remark may be very juſt; but, I confeſs, I cannot readily give credit to the former; nor have I either my own, or the experience of others, to guide my opinion with accuracy.

We have ſeen in the preceding ſection, that thirty-nine tons of turnips may be raiſed upon an acre; nay, Mr. Baker, of the Dublin Society, has informed us, that he has had forty-ſeven tons of turnips from an acre: and to ſuppoſe that the produce of one acre of carrots is equal, in point of nouriſhment, to three times forty-ſeven tons of turnips, is ſurely ſaying a great deal too much in favour of a root, which however moſt undoubtedly deſerves to be more generally cultivated; as we ſhall ſee preſently.

Horſes are extremely fond of this food, and there is not any better for hogs. Theſe roots have alſo been of ſuch ſervice to deer, in parks, that when numbers of theſe creatures have periſhed elſewhere, through want in hard winters, when there has been an extreme ſcarcity of their uſual food; thoſe that have been fed with carrots have kept their fleſh all the winter; and, upon the return of graſs in the ſpring, have been fat early in the ſeaſon. This is no inconſiderable advantage, in places where the graſs is generally backward in its growth.

But what gives this plant a very decided ſuperiority over turnips is, that the crop is not ſo liable to fail, as crops of turnips have hitherto been: for as the carrots are ſown in the ſpring, the plants generally come up well; and unleſs the months of June, and July prove very bad, they are in no danger; whereas turnips are firſt attacked by the fly, and ſlug, and in dry autumns are deſtroyed by caterpillars. Every farmer who has a ſtock of cattle, or ſheep, ſhould therefore always have a good ſtore of theſe roots.

One pound and a half of ſeed, which ſhould be ſown in March, will be ſufficient for an acre of land. Theſe ſeeds are ſo very apt to cling together, that they are more difficult to ſow, than almoſt any other: mixing them with a quantity of dry ſand, or bran, and then rubbing the whole well together, is as good a way as any to ſeparate them. For carrots, and all tap-rooted plants, the ground ſhould be plowed as deep as the nature of the ſoil will permit, and brought to as fine a tilth as poſſible. After the ſeeds are ſown, they muſt be lightly harrowed in; and when the plants come up, they ſhould be hoed and thinned, ſo as to be left ten inches, or a foot aſunder. The hoeings ſhould be repeated, ſo as to keep them clear of weeds, and no other crop ſhould ever be ſown with them, if it be intended that they ſhould have large roots fit for fodder, unleſs it be parſneps, which require the very ſame culture, and which may be profitably uſed for the ſame purpoſe.

The horſe-hoeing huſbandry managed as before directed for turnips, will make them grow to a ſurpriſing ſize. M. de Chateauvieux has given us a proof of it, in an experiment which he made, in order to ſatisfy himſelf whether pot-herbs, in general, may not be cultivated in the ſame manner as wheat is in the new huſbandry, without dung, and without the expenſive labour, and attendance beſtowed upon them in the common way.

Of three beds, each forty feet long, and ſix feet wide, he ſowed two with carrots, and one with beets. The plants were thinned where they grew too thick, ſo as to leave a diſtance of ſeven, or eight inches between the carrots, and fourteen or fifteen inches between the beet-roots. Neither of theſe were ever watered, which is indeed rendered leſs neceſſary by the new huſbandry, where the earth, being more thoroughly looſened, ſucks in, and retains the moiſture more; yet the leaves of the beets were three or four inches broader than thoſe of the ſame kinds of plants in his kitchen garden, which had been well dunged; and though the rows were ſix feet aſunder, yet the leaves of the carrots met in many places.

The beſt-roots, which I have purpoſely mentioned in this experiment, I think are very nearly allied to the root of ſcarcity, of which we have of late heard ſuch wonderful advantages. Thoſe of which I now ſpeak, were dug up on the 25th of October; were all nearly of the ſame ſize, that is, from five to ſix inches diameter towards their top, or thickeſt part.

The carrots were dug up on the 8th of November, and meaſured from eighteen to twenty and twenty-five inches in length, and from two and a half to three and a half, and four inches in diameter; and weighed from twenty-five to thirty and thirty-five ounces.

To preſerve the carrots for uſe, all the winter and ſpring, they ſhould be dug up about the beginning of November, when their green leaves are decayed; and they ſhould then be laid in dry ſand, in a dry place, where the froſt cannot reach them, in order to be taken from thence as they are wanted. Some of the largeſt and ſtraighteſt roots may be reſerved for ſeed, if it be intended to ſave any; and, in this caſe, they ſhould be tranſplanted in the ſpring, into a light and deep ſoil, where they ſhould be ſet about a foot aſunder every way. This ground muſt be kept very clear of weeds; and when the ſeed is ripe, which will be about the middle of Auguſt, it muſt be cut off, and carried to a dry place, where it ſhould be expoſed to the ſun and air for ſeveral days, to dry; it may then be beaten out, put into bags, and laid up in a dry place. This ſeed is thought to be ſeldom good after the firſt, or at moſt the ſecond year: nor indeed will it grow, after it is more than two years old. New ſeed is therefore always preferred.

Mr. Billingſley, in a letter to the Secretary of the Bath Society, ſays, that a field in which he raiſed carrots was, a few years ago, part of the foreſt of Mendip. That field contains eight acres; the ſoil a gravelly loam, of a good depth. In the year 1776, it received an ample manuring with lime, about twenty quarters per acre, and was ſown with turnips; in 1777 with barley; in 1778 it was again manured with horſe-dung, to the amount of fifteen cart-loads per acre, and was planted with large Scotch cabbage.

The produce of this crop was very great, being more than thirty tons per acre; and the ſtock maintained with it, would aſtoniſh the farmer unaccuſtomed to the cultivation of this plant. Mr. Billingſley cannot therefore forbear recommending

ing in the warmeſt manner, the culture of this cabbage, in conjunction with turnips, to every ſpirited improver, and particularly to thoſe who keep large flocks of ſheep.

Every perſon in that branch of farming muſt have frequently experienced, during ſevere froſt and deep ſnow, great difficulty in getting at his turnips. Now this inconvenience would be intirely obviated, by his poſſeſſing three or four acres of theſe cabbages. For their height and hardineſs render them acceſſible at all times, and in the moſt ſevere ſeaſons. He will not, however, ſay that the produce will be equal in weight, to a well managed crop of turnips; but, is certain, that one hundred pounds of Scotch cabbages will go as far in keeping, or fattening horned cattle, as one hundred and fifty pounds weight of turnips. This, in effect, makes Mr. Billingſley's crop of thirty tons, equal to a crop of turnips of forty-five tons weight; which is a very uncommon produce indeed. But to return:

In the ſpring 1779, Mr. Billingſley began preparing for his carrot crop; the particulars of which are as follow.

February 15th. Firſt plowing, acroſs the ridges of the cabbages, at four ſhillings per acre	£1	12	0
March 1ſt. Firſt harrowing, at nine pence per acre	0	6	0
April 15th. Second plowing, at four ſhillings per acre	1	12	0
Ditto 20th. Second (buſh) harrowing, at nine pence per acre	0	6	0
Thirty pounds of red Sandwich carrot-ſeed, at one ſhilling per pound	1	10	0
April 24th. Sowing by hand in drills one foot apart, and covering the ſeed, at thirteen ſhillings per acre	5	4	0
June 4th. Hand-hoeing and thinning, at twenty ſhillings per acre	8	0	0
October. Digging up, at thirty ſhillings per acre	12	0	0
Carting home, cutting off tops, and ſecuring	10	0	0
Rent of land	8	0	0
	£48	10	0

Produce.

Six hundred and forty ſacks, of four buſhels each, valued at three ſhillings a ſack	96	0	0
Nett profit of the crop	£47	10	0

Or nearly ſix pounds per acre. Quantity of carrots per acre, eight tons.

From experiment made by Mr. Billingſley, he is perfectly perſuaded, that carrots are worth more than three ſhillings a ſack in fattening of hogs.*

The above account of Mr. Billingſley's is confirmed by another correſpondent of the Bath Society, who has been in the practice of cultivating ſome acres of carrots annually, for a conſiderable time paſt. The objection which ſeems to ſtrike him moſt, is the charge of thirteen ſhillings per acre for ſowing and covering the ſeed in drills, which he alleges, he has found, from experience, not to be ſo eligible a mode as ſowing the ſeed broad-caſt. The drilled crops he tried were the worſt he ever grew.

The ſeeds of carrots, ſays he, though ever ſo well rubbed with ſand or any other ſubſtance, will ſtill adhere together to that degree, as to render the delivery of them in drills not only tedious, but uncertain; and wherever they fail in patches, the loſs of ground is conſiderable: beſides, the difference of nine pence, or at moſt a ſhilling per acre for random ſowing, and thirteen ſhillings per acre for drilling, is an object worth attending to. Every abridgement of expence ought certainly to be ſtudied, in all articles of which we wiſh to promote the growth. Perhaps the method purſued by this correſpondent of the Bath Society, where it can be adopted with convenience, will be found as profitable, and attended with leſs trouble than any other.

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* Bath Soc. Tranſ. Vol. I. p. 218.

In a field containing forty acres, he firſt grew a crop of turnips, which were clean hoed, and left free from weeds; they were afterwards fed upon the land, which was immediately, in the beginning of March, manured with ten loads of dung, firſt plowed in with a common plough, and afterwards trench-plowed about fourteen or fifteen inches deep; two acres of which were harrowed very fine, and the ſeed ſown about the middle of March, though it is preferable to ſow about the end of that month, becauſe the plants come up nearly as ſoon as thoſe ſown earlier, and are attended with fewer weeds.

The carrots came up regularly and well, were ready to hoe in the beginning of May, and were tolerably free from weeds; ſo free indeed, that they were hoed out with large hoes, and proved an excellent crop. The other two acres, part of the four which had been in turnips, were prepared by plowing and manuring, as for the carrots, and ſet with potatoes, which came up very clean, and proved an abundant crop. In the ſucceeding year, he grew one acre of carrots with the former preparations, on the land where the potatoes had grown; and one acre of potatoes, where the carrots had grown: the other two acres were in turnips.

For eight or ten years afterwards this field grew turnips, carrots, and potatoes, in the above-mentioned rotation: the carrots, and potatoes coming on the ſame ground only once in three years, the turnips every other year; whereby the land is become ſo clear of weeds, and ſo rich, that the crops are better every year, and the expence of hoeing leſſened by one half, at leaſt*.

Mr. Young is of opinion, that the tract of ſand between Orford, Woodbridge, and Saxmundham, grows more carrots than all the reſt of the kingdom put together. Perhaps the quantity raiſed in the neighbourhood of Chard, in Somerſetſhire, and brought to that market, may be nearly equal; and the roots ſuperior in quality.

Mr. Young viſited the former part of the country in the year 1779, and found that all the farmers there had ſome acres of their ſandy farms in carrots. The ſtraight, handſome, clean roots, ſell at ſix-pence per buſhel for the London market, and all the reſt are uſed upon the farm, chiefly for feeding the teams of horſes, at an allowance of a buſhel each horſe per day. Theſe horſes are of the fineſt cart breed, perhaps in the world; do heavy work, and never have any oats allowed them when at carrots.

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* Bath Soc. Tranſ. Vol. I. p. 235.

Mr. Young's eſtimate of the expence of carrots runs thus, and is the reſult of experience.

Rent, tythe, and rates	£1	7	0
One plowing, double the common price	0	8	0
Seed four pounds, at one ſhilling and ſix-pence	0	6	0
Sowing	0	0	6
Harrowing	0	1	0
Three hoeings, and one weeding	1	5	0
Digging up	0	10	0
	£3	17	6

Mr. Young, from a ſimilar calculation, makes them exceed the expence of turnips by twenty ſhillings at moſt. Now, ſays he, to counterbalance this extra expence; they are, firſt, much more unpenetrable to froſt, and are in the above tract of country left in the ground, to be taken up as wanted; ſecondly, they are not ſubject to any diſtempers, or accidents that approach to the evils of the hanbery, and the fly in turnips. They are alſo ſown at a ſeaſon when they cannot ſuffer by drought. Of late years, turnips have ſuffered ſo much by all theſe attacks, as to have ſubjected the farmers of Norfolk and Suffolk to very heavy loſſes. Thirdly, carrots laſt to a ſeaſon of difficulty (April) when ſtock, and eſpecially ſheep-farmers are ſo diſtreſſed, that they know not where to find a reſource; a circumſtance of ſuperiority, which every practical farmer muſt be ready enough to admit.

But perhaps the greateſt ſuperiority which carrots have, is, that they may be cultivated to advantage even in pure and barren ſands. Much tillage, and very clean ground, is not required for them, as for turnips; and a repetition of ſummer plowings, which rather injures a ſandy ſoil, is altogether avoided in their culture. One earth given with a trench-plough in March, and frequent hoeings on the ſurface through the ſummer, ſeems to be the management for this plant in ſuch a ſoil: and, if the crop is left very late in the ground, and the ſoil is very ſandy, the carrots may be ſucceeded by a crop of buck-wheat, which does not require that the land be perfectly free of the couch-graſs.

Mr. Young alleges, that, with all theſe advantages, we would naturally expect to ſee carrots more univerſally cultivated by farmers, and that the reaſon why they are not, is, becauſe their value is not yet aſcertained with any degree of preciſion.

Many trials, however, to accompliſh this have been made; but they differ ſo very widely in the reſult, that they leave us a good deal at a loſs. From the various accounts given by Mr. Young from the gentlemen who have made theſe trials, and from others, I ſhould not heſitate to determine the average value of carrots to be about twenty-five ſhillings per ton; and ſuppoſing an acre well cultivated to produce ten tons of carrots, here is a crop which may be fairly valued at twelve pounds ten ſhillings, which is better than almoſt any common crop of wheat: and the ground finely prepared for a ſucceeding one.

Mr. Young, in his application of the crop of carrots, makes the heaped buſhel of ſeventy pounds weight to be worth thirteen pence, and makes the amount of the ton averagely, to be one pound twelve ſhillings: but I chooſe to take it moderately at one pound five ſhillings.

Mr. Young calculates, that eleven tons of carrots, the average produce of an acre, will feed twenty wethers for one hundred days, in which time they will be completely fattened: this is allowing them at the rate of twelve pounds each per day, which he thinks ſufficient. In Norfolk, an acre of turnips is allowed to fatten eight wethers. So that it thus appears, that the produce of one acre of carrots is fully equal to two of turnips.

Mr. Young ſuppoſes fifty pounds of carrots ſufficient for a horſe per day, in lieu of oats, and will be found to come much cheaper.*

Mr. Billingſley, above quoted, having grown another crop of carrots on five acres, found the produce to be about ſeven tons fifteen hundred weight, which I think rather a ſmall crop; ſince the cultivators of this root about Woodbridge, and that part of the country, often raiſe from fifteen to twenty tons per acre.

Thoſe carrots Mr. Billingſley values at twenty ſhillings per ton only; which is ſeven pound fifteen ſhillings per acre. The expence of culture he ſtates thus:

Rent	£1	0	0
Three plowings	0	12	0
Three harrowings	0	3	0
Sowing	0	0	6
Seed	0	4	0
Two hoeings	0	7	6
	£2	7	0

which deducted from the value of the crop, leaves a profit of five pounds eight ſhillings per acre.†

We have this farther information concerning the culture of carrots from Mr. Kirby, at Ipſwich, in a letter to the Secretary of the Bath Society.

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* Bath Soc. Tranſ. Vol. II. p. 1.

† Bath Soc. Tranſ. Vol. II. p. 227.

The ſoil proper for the cultivation of this uſeful root is, a ſandy loam, of about ſeven or eight ſhillings per acre: that on which he has uſually grown them is of a ſharper nature, and not ſo valuable. He ſometimes ſowed them after turnips, ſummer-land barley, and peas ſet on a rye-graſs lay: the crop on the firſt has been very productive; next to that he would prefer the latter. In the firſt inſtance, the turnips are fed off in the beginning of February, and the land is then laid up in ſmall balks and furrows, in which ſtate it remains till the ſecond week in March, when it is harrowed down, double furrowed to the depth of about twelve inches, and the ſeed ſown thereon, at the rate of four pounds and a half per acre. As ſoon as the plants appear diſtinctly, they are ſet out with a ſmall hoe, at the diſtance of ſix inches from each other; they are afterwards hoed twice more at different times, according as the crop ſeems to require it; and it is not unuſual to harrow them between the hoeings, which does no injury to the root, and frequently ſaves the expence of a third hoeing: theſe three hoeings are performed at from fifteen to eighteen ſhillings per acre.

When carrots are intended to be ſown after peas, the ſtubble is plowed in as ſoon as harveſt is over, in order that the land may purge itſelf of weeds : in December it is laid up in ſmall balks to receive the benefit of the froſts ; in February it is harrowed down, and manured at the rate of fifteen loads per acre ; the manure is plowed in about four inches deep, and in the middle of March the land is double furrowed, and the ſeed ſown. By purſuing this method, the manure lies in the center of the ſoil, and not only affords nouriſhment and ſupport to the carrot in its perpendicular progreſs, but renders it eaſy to be turned up by a ſingle plowing, and greatly promotes the growth of the ſucceeding crop of barley : with this crop, he uſually lays down his land with rye-graſs ; in which ſtate it remains for two years, before it is again plowed up, and ſometimes longer.

When the carrots are fit to take up, Mr. Kirby puts them out to his labourers, ſometimes by the acre and ſometimes by the load, containing forty buſhels. For the former, if a good crop, he pays for taking up and topping, ten ſhillings and ſixpence per acre ; for the latter, from one ſhilling to one ſhilling and two pence per load ; taking particular care of the tops, which are equally valuable with the roots, for cows, ſheep, and ſwine. After the carrots are taken up, they are laid in an out-houſe, and well covered with ſtraw, to guard them againſt the froſt : though it is not unuſual with ſome farmers, to let them continue in the ground until they are wanted, which is leſs expenſive; and the weather muſt be extremely ſevere, to injure the crown of the root, which is more hardy than either a turnip or a potatoe. Nor can they be much hurt by wet in that light ſoil in which they are generally cultivated: but if the ſoil is heavy, the beſt way is to draw and houſe them as above mentioned.

There can be only one objection to the practice of letting them remain undrawn, viz. that of the ground being ſometimes rendered ſo hard by the froſt, as not to admit of their being taken up: but this may be obviated by a little care and attention, in watching the weather. At Ipſwich, the medium crop may be about three hundred and fifty buſhels, which are ſold at ſixpence per buſhel, and is eight pounds fifteen ſhillings per acre; but this, I apprehend, might be greatly improved by proper attention, and a ſuperior culture of this admirable root*; ſuch as I have already had occaſion to mention.

Let us then ſuppoſe an acre ſown in drills, and horſe-hoed. An acre will divide into one hundred and four rows, at two feet apart; and at one foot aſunder in the rows, will raiſe two hundred and eight carrots, which is per acre twenty-one thouſand ſix hundred and thirty-two; and let us take them at M. de Chateauvieux's ſmalleſt weight, which was twenty-four ounces, or one pound and a half, this will make the produce of an acre thirty-two thouſand four hundred and forty-eight pounds, or nearly fourteen tons and a half; which, I imagine, in this mode of culture may be taking them at a fair average. Now if theſe are valued at what I formerly ſtated, twenty-five ſhillings per ton, this will make the above produce worth eighteen pounds two ſhillings and ſixpence; a calculation which, I think, may be deemed moderate.

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* Bath Soc. Tranſ. Vol. III. p. 84.

Carrots, as the food of cattle, are certainly more ſubſtantial than turnips, or even cabbages; and therefore they will undoubtedly eat leſs of theſe than of either of the former: but this is a point which, though very deſireable to be underſtood, remains as yet unaſcertained.

The people of Flanders have found, by long experience, that carrots agree ſingularly well with horſes, and that theſe creatures require much leſs corn, when they are fed with them, than when fed with hay. Nay, Mr. Young ſuppoſes, that, with an allowance of fifty pounds per day to a horſe, corn might be altogether ſuppreſſed; and he even mentions an inſtance of this in the cart-horſes about Orford, Woodbridge, and Saxmundham,

ham, which he reckons a remarkably fine breed, and are fed on carrots alone, without any oats; but obſerves, that they have an allowance of a buſhel per day, which is ſeventy pounds weight; and thus, one ton will feed a horſe thirty-two days, and an acre will feed him three hundred and fifty-two days, or nearly a year, at the expence of thirteen pounds fifteen ſhillings. This, at firſt ſight, has the appearance of being dearer than oats, which, at the rate of a peck a day, makes a quarter in thirty-two days, inſtead of a ton of carrots, as above. Now I ſuppoſe the carrots at twenty-five ſhillings per ton, whereas the oats are only twenty ſhillings per quarter: but perhaps the horſes fed on carrots will eat much leſs hay, and the chaff given with their oats may alſo be ſaved.

We have to regret, however, that, in theſe matters, we have not hitherto any exact experiments to guide us.

Parſneps are another excellent, wholeſome, and very nouriſhing food for cattle. As their culture is exactly the ſame as that of carrots, any repetition of that ſubject would be ſuperfluous. They may therefore be ſown in the ſame ground: their leaves will decay at nearly the ſame time; when they may be dug up, and laid by for uſe, as before directed.

Parſnep ſeed ſhould be new: for it ſeldom grows after it is one year old.

It has long been a cuſtom in Britany, to ſow parſneps in the open field, for the food of cattle. In the tranſactions of an Agricultural Society, in that province, it is ſaid, that parſneps ſhould be univerſally cultivated; becauſe they afford the beſt of food for all kinds of cattle, during the winter, and may be uſed to great advantage to fatten them. Their hogs have no other food in that ſeaſon, and their bullocks and oxen thrive well upon it. Their cows fed with parſneps give more milk than with any other winter fodder, and that milk yields better butter, than the milk of cows nouriſhed with any other ſubſtance. Their horſes alſo fatten with this food; though ſome pretend, that it renders them leſs mettleſome, and hurts their legs and eyes.

Cattle eat theſe roots, at firſt, ſliced lengthwiſe; and when they begin not to reliſh them, they are cut in pieces, put into a large copper, preſſed down there, and boiled with only as much water as fills up the vacancies between them. They then eat them very greedily, and continue to like them.*

When it is conſidered that parſneps grow rather larger than carrots, and that they are yet more nouriſhing and ſubſtantial; and alſo that an equal quantity may be raiſed on an acre of land, we ſhall be ready to admit their great utility to the huſbandman. This is confirmed by the eſtimation ſet upon a crop of parſneps in Britany, where it is reckoned equal in value to three crops of wheat; even at four quarters per acre. The ſtrength and nouriſhment of their juice may be judged of, from the jelly they produce when boiled; and no root leaves the ground better prepared for any ſort of ſpring crop.

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* *Corps d' obſervations de la Société d' Agriculture, de Commerce, et des Arts, établee par les Etats de Bretagne. Années* 1757, *et* 1758, *page* 88.

Parſley is known to be ſuch an excellent preſervative againſt the rot in ſheep, if they are fed with it twice a week, for two or three hours each time, that it is much to be regretted there is a want of experiments on the culture of this uſeful plant, which would certainly ſucceed well if ſown in drills and cultivated according to the new huſbandry. The few ſkilful perſons who have raiſed it in the field for the uſe of ſheep, have found it turn out to great account, though ſown only in the common broad-caſt way. How much then, might we not reaſonably expect, from its greater increaſe and more perfect quality, when more completely cultivated? To a farmer who abounds in flocks, this is an object of great magnitude; and to him I recommend this intereſting experiment.

It is alſo highly probable, as Mr. Worlidge obſerves, that beſides preventing and curing the rot, the taſte of the mutton may likewiſe be much improved by this paſture; for it is certain, that the fleſh of all animals acquires a peculiar flavour from their food. This is particularly remarked in veniſon: and it is as invariable, that the ſweeteſt mutton is that which has been fed on the fineſt and ſweeteſt graſſes; as on the hills of Scotland and Wales, in the Peak of Derby, the plains of Wiltſhire, and Hampſhire, &c. and the downs of Dorſetſhire, Banſtead, &c. Whilſt, on the contrary, the coarſeſt and rankeſt mutton is produced from the groſſeſt meadows and marſhes.

The rot in ſheep is occaſioned by their feeding on too much cold and moiſt meat, ſuch as turnips, clover, and large rank graſs in low lands: it is beſt remedied by hot, and dry food; and ſuch parſley is, in a very high degree. For the ſame reaſon, thoſe that feed in ſhady places in ſome grounds, where the dew lies long on a certain broad graſs, neceſſarily incline to the rot; and this is prevented by turning them into ſalt marſhes, and brackiſh ground, or giving them ſalt, with their dry food; for ſalt is eſteemed a cure for this diſeaſe*.

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* Worlidge, in Houghton's Collection, Vol. IV. No. 12.

The beſt time for ſowing parſley in the field is, about the middle, or latter end of February. The ground cannot be in too fine tilth. Mr. Miller mentions two buſhels of ſeed as a proper quantity for an acre of land, ſown pretty thick in drills, about a foot aſunder, which will, indeed, be ſpace enough for hand-hoeing; but if horſe-hoed, will require a diſtance of two, or two feet and a half. In this way, the plants will come to the greateſt perfection: leſs ſeed will thus be requiſite, and the culture will certainly be performed much cheaper.

The roots of the common garden parſley will, when thus cultivated, grow to the ſize of a middling parſnep. Thoſe roots may alſo be boiled, and eaten, as young carrots; for they are very palatable and wholeſome, eſpecially for thoſe who are troubled with the gravel. The Dutch are very fond of them for their water-ſouchies.

Hares, and rabbits are ſo fond of parſley, that they will come from a great diſtance to feed upon it: ſo that whoever chooſes to have plenty of thoſe animals in his fields, need only ſtock them well with this plant, and he will ſoon draw to him all the hares of the country: but at the ſame time, to thoſe whoſe object is the care of their farm, and not the ſports of the field, this may come to be attended with great inconvenience;

for though the parſley-ground may be ſecured by a fence, yet thoſe creatures once attracted, may fall heavy upon other product of the farm, leſs carefully defended. This indeed ſeems to me the moſt ſerious objection to the culture of this otherwiſe very uſeful plant.

The common garden ſhirret *(Sium,* or *Siſarum)*, may likewiſe probably do well for cattle; for it is a very nouriſhing root, and has a ſweet taſte. Its proper culture is exactly the ſame as that of carrots, and parſneps, and there is no doubt of its ſucceeding well in the new huſbandry; for M. de Chateauvieux's ſhirrets, cultivated with the horſe-hoe, in an open field, were larger and plumper at the end of ſix months, than thoſe of his kitchen-garden were at the end of nineteen; even though the former had been damaged by ſlugs. The latter end of March, or the beginning of April, is the beſt time for ſowing them; and if the ſeeds are good, they will appear in five, or ſix weeks after they are ſown.

SECTION IV.

Of JERUSALEM ARTICHOKES.

THESE are propagated by planting the ſmaller roots, or the larger ones cut into pieces, with an eye, or bud to each piece, like potatoes. They may be planted either in ſpring, or autumn, in rows ſo diſtant as to admit of horſe-hoeing, which will greatly improve them in point of ſize. They will ſucceed in almoſt any ſoil that is but tolerably deep, and will multiply exceedingly. In the autumn following, when their ſtems decay, they may be taken up for uſe. When ſet in a garden, it is beſt to have them in a remote corner, as they are not ſightly, and their roots are apt to over-run every plant around them: nor is it eaſy to deſtroy them, after they have once taken poſſeſſion of the ground.

The Jeruſalem artichoke (*Helianthus*), is a ſpecies of the ſun-flower. It is a watery root, rather agreeable to the taſte, but very apt to engender wind, for which reaſon it is little eſteemed for the food of man.

When cultivated in the field, the profit of a crop of them on a clayey loam, has been found equal to the proſit of four crops of wheat, on the ſame quantity of land. This ought to recommend them more to the notice of the farmer, and particularly to ſuch as occupy cold wet lands, which are improper for carrots, and will not bring an equally profitable crop of potatoes.

The Jeruſalem artichoke is a valuable food for hogs; and thoſe who keep large ſtocks of them, may increaſe their number by means of this winter food.

The roots of this plant ſtrike deep and require a trench plowing, two common plowings, and the neceſſary horſe-hoeings. They muſt be well manured, and ſown or ſet in March, from two feet and a half, to three feet aſunder.

SECTION V.

Of the Mangel Wurzel, or Root of Scarcity.

THE Root of Scarcity, as I before obſerved, is evidently a kind of Beet, of which we have the following account, tranſmitted to the London Society from Metz, by Thomas Boothby Parkyns, Eſq. who alſo ſent ſome of the ſeeds, which were diſtributed to ſeveral of the members of that Society.

This ſeed ſhould be ſown in a bed in the garden, or other good ground well prepared, either in rows or broad-caſt, and as ſoon as the plants are the ſize of a gooſe-quill, they are to be tranſplanted into rows at eighteen inches diſtance, and eighteen inches apart in the rows.

Care muſt be taken to ſow them very thin, and to cover the ſeed, which lies in the ground about a month, an inch only. In tranſplanting, the root is not to be ſhortened, but the leaves cut at the top; the plant is then to be ſet with a dibble, ſo that the upper part of the root ſhall appear about half an inch out of the ground; this laſt precaution is very neceſſary to be attended to. Theſe plants will ſtrike root in twenty-four hours, and a man a little accuſtomed to planting, will plant with eaſe, eighteen hundred, or two thouſand a day. In the ſeed-bed, the plants like all others, muſt be kept clear of weeds: when they are planted out, after once hoeing, they will take care of themſelves, and ſuffocate every kind of weed near them.

The beſt time to ſow the ſeed is from the beginning of March, to the middle of April; the cultivator is, however, adviſed, to continue ſowing every month till the beginning of July, to have a ſucceſſion of plants.

Mr. Parkyns adds, that both leaves and roots are excellent food for man and beaſt. This plant is not liable, like the turnip, to be deſtroyed by inſects, for none touch it, nor is it affected by exceſſive drought, or the change of ſeaſons.

Horned cattle, horſes, pigs and poultry, are exceedingly fond of it, when cut ſmall. The leaves may be gathered every twelve or fifteen days; they are from thirty to forty inches long, by twenty-two to twenty-five inches broad. This exfoliation aſſiſts the increaſe of the root, inſtead of deſtroying it, as it does that of the beet-root, which it reſembles very much, both in the ſeed and leaves. This plant is excellent for milch cows, when given to them in proper proportions, as it adds much to the quality, as well as quantity of their milk; but care muſt be taken to proportion the leaves with other green food, otherwiſe they would abate the milk, and fatten them too much, it is of ſo exceedingly fattening a quality.*

It is almoſt needleſs to obſerve, that land in fine tilth, will much improve the growth of this plant. In a middling ſoil, they will not exceed four or five pounds weight, and do not produce leaves above four or five times a year: but in a good ſoil they weigh from nine to ten pounds, and put forth freſh leaves eight or nine times.

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* Lond. Soc. Tranſ. Vol. V. p. 52.

At the end of June or beginning of July, when the outſide leaves are about one foot long, they may be gathered for the firſt time, by putting the thumb into the inſide, and ſtripping them off cloſe to their inſertion into the ſtem. Thoſe which bend towards the earth are what are to be gathered, but thoſe which form the heart of the plant are to remain.

The earth round the plants ſhould now be well ſtirred, taking care to leave the crowns of the roots uncovered, for an inch and a half or two inches, as before obſerved, and forming round them a little hollow like a baſon of nine or ten inches diameter. From this time the roots grow prodigiouſly, only taking care to keep them free of weeds. The leaves have been obſerved to grow two inches in length and one inch and a half in breadth in the ſpace of twenty-four hours.

The roots ſhould be taken up before they are hurt by the froſt. The dryer they are when houſed, the better they will keep. Like potatoes or carrots, they ſhould be put in a dry place, in dry ſand, protected from the froſt; nor ſhould they be roughly handled in carrying, for they are eaſily bruiſed, which makes them rot quickly.

Thoſe roots which are intended for ſeed, ſhould be planted at the diſtance of three feet from each other and ſupported by ſtakes, for they grow five or ſix feet high. The ſeed ripens towards the end of October, and ſhould be gathered as ſoon as the white froſts appear, by cutting the ſtalks and hanging them up under ſhelter in an airy place till well dried. A root will produce ten or twelve ounces of ſeed.

To prevent the root from degenerating, care muſt be taken to change the ſoil every year from light to heavy, and from heavy to light land. The ſeed will keep three or four years unhurt.*

What farther remains to be ſaid of this root, muſt be drawn from the experiments made on its culture. On this ſubject the information communicated by Sir Thomas Beevor to the Bath Society, is well intitled to our utmoſt confidence, both from the knowledge and veracity of the author.

Sir Thomas ſays, that having received the ſeeds too late in the ſeaſon, he nevertheleſs ventured to commit them to the ground on the 12th of June: and in a few days had the ſatisfaction to find them riſe well, and in a vigorous ſtate. From that time to the 12th of October he gathered their leaves twice, and then found their roots of ſuch a ſize as to promiſe a conſiderable and profitable production. The meaſure of ſome of them was at that time fifteen inches round, the length of a few pulled up, about thirteen inches, and the average weight four pounds. The ſeeds and plants at their firſt growth, were not to be diſtinguiſhed from beets; but in order to aſcertain the difference, Sir Thomas, very judiciouſly, ſowed ſome ſeeds of the real beet on the ſame bed of mould, and on the ſame day he ſowed ſome of the mangel wurzel, and found that under the ſame management, the roots of this laſt were four times as big, and the leaves much larger than the real beet. He offered a few of the leaves to his cows, while they were at feed on very good paſture, and they readily eat them: he did the ſame to his horſes, who as readily eat the broad tender part of the leaves, but rejected the thick part of the ſtalks. He had alſo the leaves of both theſe plants dreſſed and brought to his table, and was of opinion, with ſome other gentlemen preſent, that there was a ſenſible difference in their taſte; thoſe of the ſcarcity plant being ſo like ſpinage, as hardly to be diſtinguiſhed from it; while thoſe of the beet were both harder an drier. Sir Thomas alſo informs us, that a week before, that is, about the 4th of October, he had ſeen at Lord Orford's place at Eriſwell, near Barton-mills in Suffolk, ſome plants that were almoſt twice as big as his; and he had been told, that at Mr. Daſhwood's of Ely in Norfolk, there were ſome which meaſured two feet in circumference; but theſe parcels were ſown ſix weeks ſooner than his were.

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* Dr. J. Coakley Lettſom's Account of the Culture and Uſe of the Mangel Wurzel, tranſlated from the Abbé de Commerell.

Sir Thomas ſeems to think, that this root promiſes to be of the firſt importance in the article of food for cattle.

It is not a little ſingular, that a gentleman in my neighbourhood, equally deſerving of confidence, made trial of this plant, and aſſured me, that the ground was perfectly well prepared and trenched to a great depth, but that he found on taking up theſe roots, they had not penetrated to more than five or ſix inches deep, though they had grown to three or four inches diameter on the ſurface. From this trial, he deemed them unworthy of his farther attention.

SECTION VI.

Of MADDER.

THIS is an ingredient ſo neceſſary in dying, and now become ſo conſiderable an article of commerce, that it claims particular attention;

eſpecially as it has been found, that the madder cultivated in this country is equal to that of any other. It is likewiſe an object of great importance to the huſbandman, on account of the profitable returns it may yield him; and this without any poſſibility of differing with the clergy reſpecting the tythe, that having been lately fixed by act of parliament.

M. du Hamel has favoured the world with a work written expreſsly on this ſubject, and he has likewiſe treated of it in his Elements of Agriculture; ſince the publication of which, a very complete and ſatisfactory memoir concerning it, has been given in the tranſactions of the Royal Society of Agriculture at Rouen, by M. Dambourney, whoſe judicious experiments, together with M. du Hamel's obſervations, and the directions of Mr. Arbuthnot, will enable me to lay before the public, a full and accurate account of the manner of cultivating this valuable root.

Mr. Ray mentions and deſcribes * four different kinds of *Gallium*, or *Morlugo*, baſtard madder, natives of this country, which might afford matter of uſeful experiment, for perſons ſkilled in proceſſes of this kind.

The Haſala or Lizary of Smyrna, which is the ſort uſed by the French dyers at Darnetal and

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* *Synopſis Stirpium Britannicarum*, p. 224.

Aubenas, to give cotton that fine carnation colour, for which Adrianople is famed, is a true madder. Some ſpecies of it grow naturally under hedges and in woods: and the roots of theſe, when carefully dried, yield as fine a dye as the Haſala of Smyrna. M. Dambourney has cultivated a ſpecies of madder, which was found growing wild on the rocks of Oiſel in Normandy; and the roots of this plant have yielded him as beautiful a dye, as the Haſala of the Eaſt. I ſhall ſpeak more fully of this hereafter: but cannot help obſerving here, that Mr. Ray deſcribes particularly a wild madder which grows not only on St. Vincent's rock near Briſtol, but alſo on the rocks about Biddeford in Devonſhire, and in great plenty amongſt the hedges, all over that county. As Mr. Ray calls this the *Rubia Sylveſtris Monſpeſſiulana Major*, and as M. du Hamel ſuſpects M. Dambourney's Oiſel madder to be that very ſpecies, it is ſurely a matter of much importance; and well worth the attention of patriotic gentlemen, to follow M. Dambourney's example in making proper trials of them.

The ſpecies moſt commonly cultivated is the *Rubia tinctorum ſativa*, commonly known among us by the general name of madder. It is of this ſpecies, that the plantations of madder are made in Zealand, and in the neighbourhood of Liſle.

Madder will live in almoſt any ſoil; but it does not yield every where equally fine productions. M. du Hamel has experienced that it is not fond of dry grounds. It likes a ſtrong rich earth ſituated on a moiſt bottom; but it dies if flooded. He has ſeen it thrive well in a rich loam over a clay; and obſerves, that as a clay bottom prevents the roots from penetrating very deep; they glide, as it were, along that bottom, which retains the moiſture, and there multiply and become very large. It is aſſerted that the madder, which is cultivated in the iſland of Tergoes, grows in a ſtrong rich ſoil, ſomewhat impregnated with ſalt.

M. de Corbeilles, one of M. du Hamel's correſpondents, cultivated madder with ſucceſs, in a piece of ground which is a kind of marſh. The land is full of coarſe marſh weeds; and therefore one may reaſonably ſuppoſe, from the ſucceſs which this plant has had in ſuch a ſituation, that drained marſhes, and perhaps bogs, are proper for madder. This is confirmed by the repreſentations that were made to the late king of France, who in conſequence thereof, exempted, for twenty years, the cultivators of madder, in ſuch grounds, from one of the heavieſt of taxes, (*la Taille*) impoſed on the huſbandmen in France.

When madder is to be planted in land already in tillage, it is ſufficient, in order to prepare the ground for the plant, to give it the ſame plowings as if it was intended for corn; with this general obſervation, that the plough cannot go too deep.

If the ground which is to be planted with madder, has not been lately broken up, it muſt be brought into proper tilth by the means formerly directed; and ſo managed, as to be ſufficiently looſened in the months of April, May, and June. When it has been brought to a fine tilth and well manured, it will be neceſſary to provide plants for it. It is certain that madder, as well as all other plants, can be raiſed from ſeed; but thoſe who live in a country where madder is cultivated, or who have a field of it, which they would ſacrifice in order to enlarge their plantation, may take up the plants of madder with as much care as can be, not to injure their roots, and eſpecially not to break their ſlender ones, which run juſt below the ſurface of the ground; then divide theſe roots into as many portions, as there are buds or eyes upon them, and carefully replant theſe ſlips; obſerving, to ſpread out whatever runners adhere to them. About two thouſand of theſe ſets are enough to ſtock an acre of land. M. Dambourney practiſed this method, and found it anſwer well.

When the roots of madder are taken up for dyers, numbers of plants may be obtained from

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them, without any diminution of the profit which they yield in other reſpects: for it has been experienced that the extremity of a root, provided it have but a joint and a few fibres, will produce a plant, when it is ſet ſhallow in the earth: conſequently a great number of plants may eaſily be procured, when a madder-ground is dug up; and theſe muſt be planted in autumn, becauſe, in the common method, that is the ſeaſon for taking up the roots of madder, in order to their being prepared for ſale; but, as many of theſe plants generally die, it is proper to ſet them pretty thick, in order to their being tranſplanted at due diſtances in the ſpring.

When the madder-grounds are large, a great number of plants may be obtained from them, without doing any conſiderable damage to the crop that is cultivated for ſale.

The manner of doing it is thus. When the madder has put forth ſtalks eight or ten inches long, which is generally the caſe in the courſe of April, May, or June of the ſecond year, theſe ſtalks are taken up by women, who lay hold of them near the ground, and pluck them up. Some of the ſtalks thus pulled come up with ſmall fibres to them, and they readily take root again, eſpecially if a little rain falls when they are replanted: others of them have only a little red end bottom, and the rooting of theſe is leſs certain: ſuch as are only yellow and green ſhould be rejected, becauſe very few of them will take root.

Another method frequently practiſed is, to lay down the ſtalks that they may take root, and when theſe layers are rooted, to divide them carefully from the mother plants, and take them up, after having firſt looſened the earth, the better to prevent their tender ſhoots from being injured thereby.

The ſets, of whatſoever kind they are, muſt be planted as faſt as they are taken up; the ground into which they are to be removed being firſt properly prepared.

A labourer then opens a ſtraight channel about four inches deep, in which women or children ſet the plants about three inches aſunder; other workmen cover the ſets, by filling up the channel with mould, and then proceed to a ſecond and a third, which forms the bed or ridge. The rows of madder are one foot aſunder, and the ridge will thus be three feet wide, allowing half a foot from the outſide rows to the intervals or alleys, of four feet wide, which are to be ſtirred by a plough, as hereafter directed. A ſecond bed or ridge is made parallel to the firſt, and ſo on through the field.

A rainy ſeaſon is moſt favourable for tranſplanting, becauſe in it the plants more readily take root. The ſlips or off-ſets which were laid in the autumn, and have taken root, ſhould be tranſplanted in the ſpring, in order to give them their proper diſtances.

As madder may be tranſplanted in any ſeaſon of the year, it will be right to take advantage of ſuch cloudy weather as is the forerunner of rain, either in making a new plantation, or in replanting ſpots where the madder has failed: but autumn is the beſt time for this work; not only becauſe the moiſture of that ſeaſon favours the ſtriking of the roots; but alſo becauſe the ſets then taken up are better rooted than thoſe taken up in ſpring.

If the ſoil is moiſt, or liable to be overflowed, the alleys ſhould be made lower than the beds, in order to keep them dry: but in a dry ſoil, this precaution is not neceſſary.

Great care muſt be taken to keep the ground free from weeds; and the alleys between the beds ſhould be frequently ſtirred when the weather and ground are dry. When a ſupply of new plants is wanted, it is in theſe alleys that the ſtem of the old ones are laid down in order to ſtrike root and produce freſh layers. But care ſhould be taken not to lay down too many of the ſtems, becauſe the perfection of the root depends upon the flouriſhing ſtate of the foliation; one proof amongſt many, of the nouriſhing juices which are abſorbed from the atmoſphere by the leaves of plants, and by them communicated to their ſtems and roots, through which they frequently exſude into the ſoil.

This is the way of cultivating madder as given us by M. du Hamel; but M. Dambourney has made ſome excellent diſcoveries and great improvements in the manner of cultivating this plant, which I ſhall now give, as ſuccinctly as poſſible.

The ſoil in which he firſt ſet his plants of madder was a yellow and ſandy clay, beneath which at a ſpade's depth was a bed of large gravel, cloſe knit with very ſtrong earth; but this he did not break into. In one half of this bed, which was not dunged, he ſet in December 1757, the plants of madder from Elbœuf, which is the kind cultivated about Liſle in Flanders; in the other half he ſet plants of a native madder which grew upon the rocks at Oiſel. In the autumn of 1758, he gathered ſeeds from his Oiſel plants, but thoſe of Elbœuf were not then bloſſomed, though they had put forth ſtalks three feet high; and even in 1759 they produced bloſſoms on only a few ſtalks, whilſt the Oiſel madder was loaded with them.

Mr. Dambourney found, notwithſtanding what has been ſaid to the contrary, that madder raiſed from ſeed was nearly as forward as that raiſed from ſlips. Both the roots of the ſlips and of the ſeeds ſown, occupied the whole depth of the ground ſo far as it had been looſened, and their roots had in ſeveral places penetrated through the hard bed of gravel underneath: but in order to pierce through it, three or four roots had twiſted themſelves together, and ſhaped themſelves exactly to the form of the paſſage they found between the pebbles: in conſequence of which, they were more or leſs choaked there; though they afterwards reſumed their natural ſhape and plumpneſs, in a bed of ſmall pure ſand, which lay underneath the hard bed, and in which ſome of them went to the depth of four feet.

It is plain therefore that no time is loſt by raiſing madder from the ſeed; and that this plant may be raiſed ſucceſsfully in the moſt indifferent ſoils, even without the help of dung.

He took advantage of ſome fine weather to dry in the ſun, but ſeparately, the roots he had taken up. Every thing ſeemed to give the preference to thoſe of the Elbœuf ſpecies. They were larger and redder than the others, and their powder was finer to look at: but the effect proved very different. To make a fair compariſon, he dyed, with equal quantities of theſe ſorts, two equal parcels of cotton, prepared exactly in the ſame manner: that which was dyed with the Oiſel madder, took a much brighter colour, and reſiſted during thirty minutes a boiling, which the other could not bear during ten. He alſo compared its effects with that of the Lizary or Haſala of Smyrna, and the advantage, both in point of brightneſs and durability of colour, was alſo on the ſide of the Oiſel madder.

M. Dambourney farther obſerves, that the part of the roots from which the moſt valuable colour is obtained, is the vermicular roots, reſembling in form and colour large earth-worms. Having dried them in the ſun, they contracted, and their ſkin became wrinkled; to cure which he put them in a large ſack of coarſe canvas, and ſhook them forcibly. The friction took off almoſt all the outer ſkin, and the remaining roots being cleaned by winnowing, are what ought to be called fine and true bunch madder.

The colouring part, ſays he, would ſtill be finer and more valuable, if theſe roots were dried in the ſhade, under a ſhed open on all ſides, and laid on a plaiſter floor, or any other ſubſtance that will abſorb their moiſture.

He obſerves alſo, that the eaſterly winds of the ſpring, and the heat of the ſummer, are both unfavourable to the ſetting of the plants: he would therefore recommend autumn ſor that purpoſe. What is intended for ſale, he would take up, from June to September. The impoſſibility of drying without fire the roots which he took up in October, put him upon trying to uſe them freſh, that is, in the ſtate they were in when dug out of the ground. He then waſhed them well, and as this root loſes ſeven-eighths of its weight when dried ſufficiently to reduce to powder, he judged that he muſt proportion his quantity of freſh roots accordingly. He therefore put into a quantity of liquor, which would have required one pound of powdered madder, eight pounds of freſh roots bruiſed in a mortar, and with this dyed ſome cotton in the uſual way. When the dying was finiſhed, he found the liquor was ſtill overcharged, though the cotton had imbibed too deep a dye: upon which he repeated the experiment with ſix pounds, and afterwards with four pounds; and found that this laſt proportion of undried roots gave a colour equal to what is extracted from one pound of dried and powdered madder. One half the quantity of roots may therefore be ſaved, by dying with them when firſt dug; but though this is a great ſaving, it is not the only one.

Firſt, There is no need to build kilns or ſheds, for drying the roots in changeable weather.

Secondly, It exempts from the inconveniency of too haſty or too ſlow drying, either of which is equally hurtful to the quality of the madder.

Thirdly, The waſte occaſioned by the peeling, garbling, winnowing, &c. of the roots, is hereby ſaved: in doing of which, many if not all the ſmall roots, that are not thicker than ſtraws, are ſeparated, with the refuſe parts, and are generally loſt.

Fourthly, The expence of grinding is ſaved, together with the waſte and fraud which may be committed at the mill; and alſo the inconvenience of waiting till the mill is at liberty, which is of no ſmall conſequence, when there are not mills appropriated to the grinding of madder only.

Fifthly and laſtly, The roots thus uſed, do not evaporate or ferment, as the powdered madder always does, if it be not ſpeedily uſed.

All theſe advantages put together may be deemed equivalent to a ſaving of five eighths of the quantity. The planter who knows how to dye, may reap the benefit of them the moment his roots are large enough to be taken up: the dyers by trade will by degrees become ſenſible of the advantage, and ſhare the profit with the planter, when the madder-grounds are near them: they will even find themſelves under a neceſſity of ſo doing whenever this method ſhall become general, and this will be the means of rendering it ſuch; for as there is no particular time to be waited for, in order to the madder's acquiring maturity, after it has been planted eighteen months; the huſbandman who carries a parcel of freſh roots to market, will be ſure of ſelling them in that ſtate, and the dyer may buy them daily, in proportion to the quantity he wants; or he may agree with the planter, for ſuch and ſuch quantities, to be delivered at ſuch and ſuch times. M. Dambourney alſo experienced, that theſe roots may be kept freſh during ſeveral months, by laying them in a hole three feet deep, in alternate layers of roots and of earth. This ſeems to me a point of real conſequence in the cultivation of madder; ſince it enables the planter to hold it till he finds a ſuitable market, without being obliged to diſpoſe of it to the manufacturers with precipitation, at an under value; or enter into all the detail of its kiln-drying, or other preparation.

The only remaining difficulty is, in the manner of taking up the roots of this plant, which puſh perpendicularly, and penetrate deep.

M. du Hamel's directions are to open the bed with a plough, without its coulter, whilſt women follow and gather up the roots. If the ground is hard, the clods are broken, in order the more eaſily to ſeparate the roots from the mould.

Another way, and I think a better one, is to turn the earth of the beds over the alleys, with a pronged fork, and have women to pick up the roots, as before mentioned. This may be more tedious and more expenſive, but ſurely the roots and ſmall fibres will be thus more carefully collected.

If it be neceſſary to go pretty deep with this ſort of trenching, it doubtleſs becomes a noble preparation for a ſucceeding crop of madder; turning the alleys into beds, and the beds into alleys.

M. Dambourney proceeds to ſay, that, after full experience, he prefers raiſing madder from the ſeed, rather than from ſlips, as being by far the moſt expeditious way: and tells us, that his manner of doing it was thus.

Along a wall which fences off the north wind, let a trench be dug, two feet deep and five feet wide, and of any convenient length; then, towards the middle of February, let it be filled with hot dung of horſes or mules, preſſed down till within about three inches of the level of the ground, and then fill it quite up to the top with fine mellow mould preſſed down gently, and laid ſmooth with a rake. This bed may be ſown with ſeeds five or ſix times a year, and may afterwards be uſed for manure.

The great advantage of ſuch a bed is, its gaining at leaſt a month in the time of ſowing the ſeed in the ſpring. The ſeeds ſhould be ſown in drills one inch deep, and three inches apart, which facilitates the covering of the ſeed, and weeding of the plants. The young plants appeared in nineteen or twenty days, they were weeded and watered when neceſſary, and were fit to be tranſplanted by the 30th of April. M. Dambourney found, that ſteeping the ſeed accelerated its ſprouting in the ſeed-bed; but this he did in a ſingular way, by putting ſome fine mould in a box and then ſprinkling ſome ſeed on the mould, then again putting a layer of mould and then ſprinkling more ſeeds, all which he kept well watered, though expoſed to the ſun; and he examined the ſeed every day. On the eighth, the germ began to appear, and the next day it was three quarters of an inch long. He immediately laid in the channels or drills of the hot-bed, both the ſeeds and the mould in which they had ſprouted, and, hoeing ſmooth the ſurface of the bed, all the rows appeared diſtinctly two days after. The growth of theſe young plants was extremely rapid.

The manner of collecting the ſeeds ought likewiſe to be noticed. When ripe, all the tops were cut off with a reaping hook, and laid upon cloths in the ſun. In two or three days, the ſtalks or leaves became ſo brittle and dry, that a few ſtrokes of a ſwitch reduced them into duſt: two turns of a winnow blew away the duſt, and unripe ſeeds; which, when dried, are lighter than the others.

After the ſeed has been thus ſeparated, it ſhould be well dried in the ſun, to prevent fermentation, or at leaſt a mouldineſs which will deſtroy the germ. It muſt afterwards be put into bags of thin cloth, and thoſe ſhould be hung up to the ceiling of a dry and airy place, to preſerve them both from moiſture and mice.

M. du Hamel thinks the month of September the moſt proper time for cutting madder, in order to make it into hay.

The Flemings cut theirs in Auguſt; but that is when they do not intend to ſave the ſeed, of which indeed their madder yields but little.

Mr. Ray informs us, that the madder which grows wild in England preſerves its verdure all the winter. Were this cultivated, it might become a great acquiſition as a winter and ſpring ſucculent food for cattle; which would add vaſtly to its value, for it has been found to be an excellent fodder.

Cows fed with madder yield plenty of milk, which is a little tinged with red; and the butter of it is yellow, and well taſted.

After the madder has been cut for hay, the ground ſhould be gently ſtirred, eſpecially in the alleys; and more particularly if theſe are to be planted with madder the next year.

When the ſame ground is to be planted anew with madder, the whole of it ſhould be thoroughly plowed after all the roots are taken up, and the beds ſhould now be made where the alleys were before. If the ground be ſown with wheat after this ſecond crop of madder has been taken up, the farmer may reaſonably expect an abundant crop of corn: for beſides that madder does not impoveriſh the ſoil, the weeding and frequent ſtirrings neceſſary for the culture of this plant, prepare it well for wheat, or any other crop.

Madder ſhould not be too long, nor too ſhort time in the ground; for in the former caſe, the roots yield leſs dye, than when they have only ſtood till of a proper ſize; in the latter caſe, they do not yield, becauſe they have too great a proportion of bark, which deadens the colour. The moſt proper thickneſs for thoſe which are of a good quality is, from the ſize of a gooſe-quill, to that of the end of the little finger.

It is neceſſary to dry the roots of madder when they are to be carried to a diſtance from the place of their growth. For this purpoſe M. du Hamel has given the following directions. As the roots are taken up, they ſhould be ſpread on a dry lawn: for when there is a drying ſunſhine, and a drying wind, it will be right to take advantage of theſe helps, to begin to dry the roots. If the weather be lowering, or threaten rain, it is moſt adviſeable to ſpread the roots on hurdles, covered with coarſe cloth, in order to their more eaſy conveyance under cover, in caſe of rain. If it be rainy, they ſhould be ſpread in barn-floors, or laid under ſheds. For the greater convenience of turning them, which it is neceſſary to do frequently, both that they may dry equally, and to prevent their tendency to fermentation, to which they are very liable; there ſhould be two ſets of hurdles, each covered with a coarſe cloth, and when the madder is to be turned, one of theſe hurdles, then unoccupied, being laid over the roots, and held faſt to the under one, on which they were previouſly ſpread, the whole may be inverted together, in ſuch manner, that the roots will remain ſpread, as they were before, at the ſame time that they will be turned on the hurdle laſt applied. Another advantage attending this method is, that the hurdles themſelves may be rendered quite dry, during the intervals between each of the turnings. Both M. du Hamel, and M. Dam-

M. Dambourney are of opinion, that the beſt way of drying madder, for improving its quality, is to do it wholly in the ſhade by the ſole action of the air upon it; which is ſaid to be the practice at Smyrna.

If the weather is ſuch, that it cannot alone dry the madder ſufficiently to prevent its tendency to putrefaction, M. du Hamel obſerves, that ovens may ſerve to complete the drying of it, where the quantity is not too great. Theſe ovens, he ſays, may be heated to about forty-five or fifty degrees of Réaumur's thermometer; that is, from one hundred and fifteen to one hundred and twenty-five of Fahrenheit's. He likewiſe recommends making a place on the top of the oven to put the roots in, that they may there begin to dry.

In drying this root, great care muſt be taken to avoid ſmoaking it, that being extremely hurtful. This makes both hop and malt-kilns improper for this purpoſe.

M. du Hamel ſays, the ſigns of good roots are, that they be free of ſpots, and have no mouldy ſmell. If they are black, they are to be rejected. They ſhould be new, to yield much dye: thoſe therefore are bad, which emit a duſt when broken, or which are rotten, or worm-eaten.

Thoſe which have a ſtrong ſmell, ſomewhat like liquorice, ſhould be preferred. The madder that has been ground, ſhould feel clammy, and adhere together in lumps when handled.

Too haſty a drying makes the bark wrinkle, and ſplit; and as it then ſeparates eaſily from the harder ſubſtance, the moſt uſeful part is loſt: the bark ſhould therefore be ſmooth, entire, and adherent to the woody part. This bark muſt not be confounded with the outer bark, which laſt can only leſſen the brightneſs of the reſt.

On breaking the roots, one perceives two pretty diſtinct ſubſtances: that which inclines to a yellow, only parts the dye; but that which is of a deep red, is the part really uſeful: conſequently, the higheſt coloured roots ſhould be preferred.

It would be a very uſeful diſcovery, could there be a method found out, of extracting the red part, without any mixture with the yellow. I am ſenſible, however, that this is more the buſineſs of the manufacturer, than of the farmer, and ſhall therefore drop this ſubject, in order to proceed to Mr. Arbuthnot's account of the culture of madder, as I find it inſerted in Mr. Young's Eaſtern Tour.

In giving this account, however, I beg leave to obſerve, that I by no means intend to tranſcribe; as this would lead me far beyond the limits I have allowed myſelf: for I have more than once declared, that my conſtant aim is to contract, not to dilate; being ſenſible how formidable long books are, even where much inſtruction is conveyed to the reader.

Mr. Arbuthnot's idea in agriculture, as we are informed by Mr. Young, was to attend to the cultivation of thoſe plants, which, with leſs trouble, would bring larger profit, than what was generally the reſult of the common crops of the farmer; whoſe frugality, and attention to the minutiæ of the buſineſs, contributed much more than his ſkill to procure him a livelihood.

But if extreme frugality and attention to minutiæ are the principal reſources of common farmers, it muſt be allowed that gentlemen farmers have great advantages over them in many particulars; for inſtance, a greater command of capital—a more liberal knowledge of the art—a leſs hurtful œconomy in trifles which prevent every ſort of improvement.

It is not, however, my buſineſs to combat this idea; I avoid all controverſy, and argumentative diſcuſſion: I ſhall only obſerve, that if ſuch an idea was to become general, hops, madder, weld, &c. might ſoon be reduced to little value, when beans, wheat, and barley, would riſe to a price that would again give them the pre-eminence.

My own opinion is, that far the beſt way for both gentlemen and farmers is, to riſk little on any one crop, but to diverſify their culture. This is both ſafe and amuſing, and each crop aſſiſts another. A farmer might thus, without danger, cultivate twelve or twenty acres of madder, where his ſoil was ſuitable to ſuch a crop; but more would be going beyond the bounds of diſcretion, for a love of gain.

Mr. Arbuthnot was the firſt perſon in this country, I believe, who attempted the culture of madder on an extenſive ſcale; and from his knowledge and attention to this branch, he has clearly demonſtrated that it may be done to great advantage in this country, as well as abroad.

The way he began this work, in March 1765, was by digging an acre of black loam eighteen inches deep, which he planted with winter plants; that is, with parts of the runners, and crowns of the roots, on which the buds are made for that year's growth. The rows were eighteen inches aſunder, and ſix inches from plant to plant. As ſoon as the ſhoots were ten inches high, the plantation was hand-hoed; which operation was repeated twice more, during the ſummer, ſo as to keep the land quite free from weeds.

1766. In the ſpring of this year, as ſoon as ſhoots appeared, they were earthed up with hand-hoes; and when eight inches high were drawn for planting other land; after which the rows were earthed again: when the ſhoots were eight inches high, they were again drawn, and after another earthing the ſame for the third time. In autumn, the beds were earthed again, and the haulm that remained was buried by digging earth in the intervals, and ſpreading it on the rows.

1767. This ſpring, plants were once drawn off and earthed as laſt year; alſo hand-hoed twice. In autumn, the crop was dug up with ſpades, and the madder clean picked: but the crop did not produce ten pounds, from the plants being ſo often drawn; ſo that this acre might more properly be reckoned a nurſery for plants, than a crop of madder.

The expence of the cultivation of this acre, was twenty-ſix pounds nine ſhillings without manure: and I am perſuaded, that it would have turned to good account, if the plants had been drawn more ſparingly, in the manner before recommended by M. Dambourney. But it is remarkable, that during all the experiments made by Mr. Arbuthnot, he never ſeems once to have thought of cultivating this plant from the ſeed; a method which ſeems to have ſucceeded ſo well with M. Dambourney.

At Michaelmas 1765, Mr. Arbuthnot plowed up with a ſtrong wheel-plough, ſeven acres of a ſandy loam, fourteen inches deep. Upon this plowing, it was manured with ten loads of forty buſhels each, of yard dung, which was turned in by landing up for the winter, on to three feet ridges.

The beginning of March 1766, plowed it again; reverſing the ridges thrown up the preceding autumn. The ſame month they were planted with winter plants,* a ſingle row on each ridge; the plants eighteen inches aſunder. The method uſed in planting was to draw furrows with hand-hoes, and then the ſets were laid in them, and covered with hoes: I cannot conceive why Mr. Arbuthnot preferred this method to dibbling in the plants, which allows of more care in ſetting them upright and fixing the earth round them.

Moſt part of the field miſcarried, owing to the falling of an unuſual quantity of rain, and the ſpring plowing being given when the land was wet. The whole was therefore plowed up, and in May was again planted with ſpring plants, bought at eight ſhillings per thouſand†; the rows two feet by eighteen inches, which is fifteen thouſand per acre; whereas M. du Hamel makes two thouſand ſufficient, owing to his very wide intervals. Theſe plants were dibbled in, and during the ſummer were kept clean, by three hand hoeings; and in the autumn the rows were covered with earth dug in the intervals.

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* Winter plants, are that part of the root on which the eye are made; and which are cut in lengths of two or three inches, in the ſame manner as hop plants.

Mr. Arbuthnot does not approve their uſe, becauſe they remain ſo long in the ground that they are ſubject to rot, eſpecially if it be moiſt. This he attributes to the want of fibres, which they had on the mother plant.

1767. This year the field was hand hoed twice.

1768. And again the ſame this year. In autumn, it was plowed up with the great wheel-plough, to the depth of eighteen inches, with twelve horſes. Men followed the plough with pronged forks, to throw the madder out of the furrows, and women and children followed to pick it up. The produce was four tons four hundred weight on the ſeven acres, at four pounds ten ſhillings per hundred weight.

Expences per acre.

1765. Firſt plowing	£ 1	4	0
Manuring	3	10	0
Carry over	£ 4	14	0

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† I wiſh, for the ſake of information to the cultivators of madder, that Mr. Young had told us how Mr. Arbuthnot had procured plants at eight ſhillings per thouſand, at a time when no madder was cultivated in this country. This, I think, required explanation.

Brought over £	4	14	0
Landing up	0	7	6
1766. Spring plowing	0	7	6
Planting	1	0	0
Plowing up	0	7	6
Planting the ſecond time	1	10	0
The plants	6	0	0
Three hand hoeings	1	10	0
Digging in autumn	0	10	0
1767. Two hand hoeings	1	0	0
1768. Ditto	1	0	0
Taking up, all expences included	7	0	0
Drying, at three ſhillings per hundred weight	1	16	0
Three years rent, tythe, and town charges	3	6	0
£	30	8	6

Produce.

Twelve hundred weight of madder, at four pounds ten ſhillings	54	0	0
Expences as above	30	8	6
Clear profit £	23	11	6
Or, per annum, £	7	17	2

Now, eight pounds per acre were here incurred by accident; ſo that with better fortune, the profit would have been above thirty pounds an acre.

However, to take the fact as it really happened, the profit is very conſiderable, and much exceeds what can be gained by common huſbandry. For five quarters of wheat raiſed every year, which by the bye is impoſſible, will not equal this amount. Plants were drawn from this crop, but not in abundance.

Second Experiment.

Nine other acres of the ſame ſoil were plowed fourteen inches deep at Michaelmas, 1765, and dunged with ten loads an acre of yard dung, covered by landing up.

1766. This ſpring it was planted with ſpring plants, dibbled in rows two feet aſunder, by eighteen inches from plant to plant; and kept clean through the ſummer by three hand hoeings; and in autumn, the furrows were dug and the earth thrown over the plants.

1767. This year it was kept clean by two hand hoeings.

1768. In February, a large compoſt, conſiſting of farm-yard dung and ſome aſhes laid on the head land, and mixed with a large quantity of virgin earth, was ſpread on the land, and in the ſummer it was hand hoed twice. In autumn, it was plowed up to the depth of eighteen inches, and the crop, when dry, amounted to twelve hundred weight per acre, at four pounds ten ſhillings. But three lands, of three rows each, were left for farther growth of three years longer, by way of experiment, to diſcover the increaſe of the root in ſtanding three years extraordinary.

Expences.

1765. Plowing	£ 1	4	0
Manuring	3	10	0
Landing up	0	7	6
1766. Spring earth	0	7	6
Planting	1	0	0
Three hand hoeings	1	10	0
Autumnal digging	0	10	0
1767. Two hand hoeings	1	0	0
1768. Manuring	4	0	0
Two hand hoeings	1	0	0
Digging up	7	0	0
Drying, at three ſhillings per hundred weight	1	16	0
Three years rent, &c.	3	6	0
	£ 26	11	0

Produce, twelve hundred weight, at four pounds ten ſhillings	54	0	0
Expences as above	26	11	0
Clear profit	27	9	0
Or, per annum	£ 9	3	0

Mr. Arbuthnot remarks on this crop, that the plants were too far aſunder, and the laſt dunging did not anſwer; as by earthing, it drew up ſhoots, that ſhowed the appearance of great increaſe, when the crop was taken up; but thoſe tops being more ſucculent than the other part of the root, they withered in proportion to their ſucculency.

The profit is very conſiderable: nine pounds three ſhillings per acre clear, is ſuch an advantage, as can never be expected in the common huſbandry.

Third Experiment.

In 1766, nine acres were fallowed, receiving in all ſix earths: the firſt fourteen inches deep, and landed up in autumn by the laſt, being at the ſame time thrown on to four feet ridges.

1767. In the ſpring it was manured at the rate of five ſacks per acre of wood-aſhes, and five quarters per acre of trotters; and the whole covered by reverſing the ridges. It was then planted with dibbles: ſix acres, with one row on a land; two acres and a half, with two rows on a land; and half an acre, with one row on two-foot lands. Theſe variations were made by way of trial, to diſcover the moſt profitable method of planting. The ſets in each one foot aſunder.

This ſummer the rows were hand hoed three times; and many hard clods being tumbled, by the firſt hoeing, into the furrows, they were cruſhed to pieces by a ſmall ſpiky roller.

The intervals were horſe-hoed thrice with a ſhim, which cuts the land and weeds, but does not bury them. After each ſhimming, followed another implement, the double mould-board plough, with moveable earth-boards, expanding at pleaſure; this machine raiſes the looſe earth from the furrows, which was moved by the ſhim, earthing up the beds.

Theſe operations were the ſame to all, except the half acre planted on narrow lands, which could only be hand-hoed. In autumn, the furrows were again ſtruck with the double mould-board plough.

1768. This year the beds were hand-hoed thrice, and the furrows ſhimmed three times, followed each time, as before, with the double mould-board plough. On the laſt hand-hoeing, two acres were ſown with weld, as the madder plants ſtood thin on theſe acres.

The furrows in autumn ſtruck as before, with the double mould-board plough.

1769. This year the rows were horſe-hoed twice; and the furrows plowed with the ſhim and double mould-board plough thrice; but none of theſe operations to the two acres where the weld was ſown. In July the weld was pulled; and in October the madder taken up with the great plough.

No. I. On the half-acre, ſingle rows on two-feet land, ſix hundred weight.

No. II. On the ſix acres, ſingle rows, on four-feet lands, eight hundred weight per acre.

No. III. On the two and a half acres, double rows on four-feet lands, ten hundred weight per acre, and ſeventy-two pounds worth of weld on the two acres*; but the half-acre, where no weld grew, was the beſt part.

Account of No. I.

Proportions per acre.

1766. Five plowings, at ſeven ſhillings and ſixpence	£ 1	17	6
One deep ditto	0	17	0
1767. Five quarters of trotters	3	0	0
Five ſacks of wood-aſhes	0	12	6
Plowing	0	7	6
Planting	1	5	0
Three hand-hoeings	1	10	0
Striking furrows	0	1	2
1768. Three hand-hoeings	1	10	0
Carry over	£ 11	0	8

Striking

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* Weld was that year twelve pounds a load.

Brought over £	11	0	8
Striking furrows	0	1	2
1769. Two hand-hoeings	1	0	0
Taking up the madder	5	10	0
Drying, at three ſhillings	1	16	0
Rent, tythe, and town-charges, four years	4	8	0
	23	15	10

Produce.

Twelve hundred weight, at four pounds ten ſhillings	54	0	0
Expences	23	15	10
Clear profit £	30	4	2

Account of No. II.

Expences.

1766. Five earths at ſeven ſhillings and ſix-pence £	1	17	6
One deep ditto	0	17	0
1767. Trotters and aſhes	3	12	6
Plowing	0	7	6
Planting	1	0	0
Three hand-hoeings	1	10	0
Rolling furrows with ſpiky roller	0	0	8
Carry over £	9	5	2

Brought over	£ 9	5	2
Horſe-hoeing with ſhim thrice, at eight pence	0	2	0
Ditto double mould-board plough, four times, at one ſhilling and two-pence	0	4	8
1768. Three hand-hoeings	1	10	0
Shimming thrice	0	2	0
Double mould-board plough, four times	0	4	8
1769. Two hand-hoeings	1	0	0
Shimming thrice	0	2	0
Double mould-board plough	0	4	8
Taking up	5	10	0
Drying, at three ſhillings	1	4	0
Four years rent, &c.	4	8	0
	£ 23	17	2

Produce.

Eight hundred weight, at four pounds ten ſhillings	£ 36	0	0
Expences	23	17	2
Clear profit	£ 12	2	10

Account of No. III.

1766. Plowing as before	£ 2	14	6
1767. Trotters and aſhes	3	12	6
Carry over	£ 6	7	0

Plowing

	£	s.	d.
Brought over £	6	7	0
Plowing	0	7	6
Planting	1	5	0
Hand and horſe-hoeing, as in No. II.	1	17	4
1768. Ditto	1	16	8
Weld ſeed and ſowing	0	1	6
1769. Pulling the weld, &c.	1	10	0
Taking up the madder	5	10	0
Drying, at three ſhillings	1	10	0
Four years rent, &c.	4	8	0
£	24	13	0

Produce.

	£	s.	d.
Ten hundred weight of madder, at four pounds ten ſhillings £	45	0	0
Weld	36	0	0
	81	0	0
Expences	24	13	0
Clear profit £	56	7	0

I have ſelected ſome of the moſt intereſting examples from Mr. Arbuthnot's practice. To go through the whole would be too tedious, without giving important information. I ſhall therefore briefly ſtate ſome farther obſervations, which ariſe from his experience.

He made trial of an old lay, but loſt his crop entirely by means of the ſod or wyer worm, although he had the precaution to lime his land with ſeventy-four buſhels per acre: but I ſuſpect this was neither quantity ſufficient, nor was the quality good, that is, the lime was not hot from the kiln; otherwiſe it would have deſtroyed the worms.

As madder requires a very deep ſoil, and a ſpecies of dunging and culture peculiar to itſelf, it is obvious, that the ground once prepared for this plant ſhould be continued for the ſame purpoſe; which may eaſily be done, by changing alternately the beds and alleys.

Mr. Arbuthnot obſerved, from an experiment made on a plant in his garden, that by earthing up the rows, the ſtalk was converted into the richeſt part of the root: this uncommon circumſtance ſuggeſted the idea of planting in the furrows inſtead of the ridges, with intention of forming the ridge into a rich compoſt, and turning it gradually to the rows, until the furrows came to be ſituated in the center of the old ridges, and the plants growing on the newly made ones: in a word, to plant and cultivate madder, in the ſame manner that celery is planted and cultivated. The idea is new, and ſeems to promiſe ſucceſs; I do not, however, know that it is yet ſanctioned by experience.

It ſhould here be obſerved, that Mr. Arbuthnot is clearly of opinion, that no crop requires cleaner ground, from the great difficulty of extracting root weeds from among the fibres of the plants, which would conſequently get intire poſſeſſion of the ground in the courſe of three years. He conſtantly found the roots of madder to bear exact proportion to the luxuriance of the branches and leaves.

The average profit per acre, on all the crops then taken up, amounted to above ſeven pounds ſeven ſhillings, which is a vaſt deal in the culture of a new plant, that experience would certainly bring to a higher degree of perfection; for Mr. Arbuthnot's crops then on the ground promiſed more than any of his preceeding ones.

If Mr. Arbuthnot had been acquainted with M. Dambourney's ingenious method of raiſing plants by means of ſeed-beds, I am perſuaded he would have adopted it with ſucceſs. It is ſingular enough, that Mr. Young has never hinted at Mr. Arbuthnot's method of drying his roots, nor to what market he carried them; which are both points of great conſequence to the grower.

ESSAY VIII.

Of the Enemies to Corn, and the Means of preſerving it.

M. Du Hamel, in his Elements of Agriculture, has treated this intereſting ſubject much more fully and more accurately than any of our Engliſh authors: I ſhall therefore chiefly have recourſe to him for information on this head.

SECTION I.

Of the Diſeaſes of Plants.

SMUT in corn, and burnt grain, though quite different diſtempers, are often confounded, becauſe they are very often found in the ſame field, and prevail moſt in the ſame years: they both attack the ſame ſorts of grain, and the mealy ſubſtance is converted by both into a powder, more or leſs black and offenſive to the ſmell. They have, however, their diſtinguiſhing marks, and muſt be treated of ſeparately.

The ſmut entirely deſtroys the germ and ſubſtance of the grain. Not only the ear, but the whole plant is affected by it: and generally the whole of the ears from the ſame root.

So early as March or April, upon opening the hood which covers the ear, not then above the ſixth part of an inch in length and almoſt cloſe to the roots, this embryo has been found black and diſeaſed: but perhaps all are not attacked ſo early.

When the diſtempered ear comes out, it looks lank and meagre, and the immediate coverings of the grains are ſo thin, that the black powder is ſeen through them; it has a fœtid ſmell, has no conſiſtency, and occupies the place of the grain. As this powder is eaſily blown off by wind, or waſhed away by rain; the huſbandman in houſing theſe plants, houſes only the ſkeletons of the ears. Any remainder of this powder is eaſily taken off by ſifting. It has not been found contagious like that of burnt-grain.

My very worthy and intelligent friend, Mr. Small, informed me, that an acquaintance of his, remarkable for his attention to every circumſtance relating to agriculture ; in order to aſcertain this fact from experiment, prepared a piece of well cultivated land, in which he ſowed ſome wheat-ſeed, from a ſmutty crop, and which was threſhed and dreſſed in common with the reſt. He alſo picked ſome ſmutty ears, which he broke, and mixed the duſt with the ſound grain. He ſowed both parcels in equi-diſtant rows, and had both properly hoed. They produced a plentiful crop of fine grain ; and Mr. Small does not recollect that there was one ſmutty ear among the whole. From hence he concludes, that ſmut is not contagious, and probably no inſect, but proceeds from want of good culture, or ſome other cauſe, yet undiſcovered.

The upper part of the ſtalk of a ſmutty plant, is not commonly quite ſtraight, for about half an inch below the ear. If the ſtalk be cut aſunder in that part, it will be found almoſt intirely filled with pith, and only a very ſmall opening can be perceived, inſtead of the large pipe in healthy ſtems. M. Tillet concludes from hence, that the circulation of the juices is obſtructed in the ſtem of ſmutty plants. It is ſingular enough, that there is no inſtance, to my knowledge, of ſmutty rye.

Some naturaliſts have aſcribed this diſtemper to inſects : among thoſe is Dr. George Fordyce, whoſe authority carries great weight: but M. du Hamel ſays, that having himſelf been of this opinion for ſome time, all his endeavours to eſtabliſh it by facts proved ineffectual.

The Reverend Dr. Hales thought the ſmut might proceed from the ſeed being bruiſed by the flail, and therefore took ſeeds of different ſizes and bruiſed them with a hammer. They grew well, and produced no ſmutty plants.

The conjectures about the cauſes of this diſtemper have been ſo numerous, that it would be tedious to repeat them. The moſt ſenſible and approved modes of preventing it, are infinitely more uſeful.

M. Aimen has obſerved, and I believe with great juſtice, that weak plants are moſt ſubject to this diſtemper. He is therefore of opinion, that the beſt means of prevention are, to chooſe the fineſt and ripeſt corn for ſeed; that it ſhould be threſhed as ſoon as poſſible, and that it ſhould be limed immediately after; as well, ſays he, to keep it from growing mouldy; as to deſtroy the mould already formed, if any ſuch there be; adding, that every method he has tried to make corn ſo prepared, grow mouldy, has been ineffectual and that he has never known it produce ſmutty ears.

He alſo recommends good tillage, as a ſure method of giving ſtrength and vigour: and if horſe-hoed and managed according to the new mode of culture, it is highly probable it never would be ſmutty. He obſerves, that moſt of the lyes in uſe do good, becauſe lime is a principal ingredient in them all, and is the moſt effectual of any. M. de Lignerolle ſays, that the ſureſt means of avoiding ſmut, and what he has practiſed annually, and with great ſucceſs, on upwards of three hundred acres of land, is to change the ſeed every year, to be careful that the ſeed corn be thoroughly ripe and well dried, and that it be not ſmutty, nor have any ſmutty powder ſticking to it. He then waſhes it with a lye made with hot lime: but of theſe I have given various recipes in the article *of preparing the ſeed.*

Mr. Tull, too, recommends brining and changing the ſeed, as general remedies for ſmut; but above all, he aſſures us, that the drill huſbandry is the moſt effectual cure of any.

I have already obſerved, that M. du Hamel diſtinguiſhes burnt-grain from the ſmutty, and makes it infinitely more dangerous, from its being a contagious diſtemper, which he alleges ſmut is not, and of which I have juſt given a very ſtrong proof.

Of Burnt-Ears.

The following are the characters of this diſtemper, which the Romans called *uſtilago* and the French name *charbon.*

Firſt, The plants which produce burnt-ears are ſtrong and vigorous.

Secondly, The ears attacked, are not readily diſtinguiſhable from the ſound; but after bloſſoming, they become of a deep blueiſh green, and then turn whitiſh, and are thus eaſily diſtinguiſhed. This diſtemper is thought to be occaſioned by an intenſe heat of the ſun, or by a fog, which has preceeded that intenſe heat.

Thirdly, All the ears proceeding from the ſame ſeed, are uſually attacked with this diſtemper: yet ſound ears have been found in the ſame plant with the infected. Some infected ears have been found with ſound grains, nay even grains have been ſeen half ſound and half infected.

M. du Hamel, in his Elements of Agriculture,* gives a very particular deſcription of all the ſigns by which burnt-grain may be known, and to him I muſt beg leave to refer, in order to avoid prolixity on this ſubject.

The cauſe of this diſtemper has hitherto been as little known as that of ſmut; though there have been full as many conjectures about it. But the beſt way of preventing it is, by thoſe methods I have pointed out in the article above mentioned, where I recommend well waſhing, ſkimming and brining, &c.

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* Tom. I. p. 314.

Of the Spur.

The diſtemper called the ſpur, and which the French name *ergot*, frequently attacks rye, and ſometimes wheat. The grains which have the ſpur, are thicker and longer than the ſound ones, and generally project beyond their huſks, appearing ſometimes ſtraight and ſometimes more or leſs crooked. Their outſides are brown or black; their ſurface is rough, and it is not unuſual to perceive cavities there, which ſeem to have been made by inſects. There are yet other ſymptoms, for a deſcription of which I ſhall refer to the work above quoted,* where the curious may alſo find many ſingular circumſtances about it, and particularly its fatal effects upon thoſe poor people, who have eaten bread made of rye-flour infected with this diſtemper.

Of the Mildew.

The mildew attacks the blades and the ſtems of corn, which it covers with a powder of the colour of ruſt, when at the height of their vegetation. This diſtemper is commonly imputed to dry, gloomy, and hazy weather ſucceeded by a hot ſun, which will ruſt the corn in a few days. It is ſometimes very fatal, for the fineſt wheat is ſuddenly reduced to nothing, when completely attacked by it. If it attacks the plants while they are young, and before their ſtems begin to riſe, the miſchief is ſometimes not very great, provided there comes on a ſeaſon favourable to their farther growth. In this caſe, they are only weakened, as if they had been fed or mowed. They ſhoot out anew, and produce ears: though their ſtraw is ſhorter, and the ears ſmaller, than they would otherwiſe have been. But if both blades and ſtalks are mildewed at the ſame time, the farther growth of the plant is ſtopped, and the grain gets ſcarcely any more nouriſhment; ſo that the crop is exceedingly diminiſhed.

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* Page 333.

M. Tillet imputes it to a ſharpneſs in the air, in dry cloudy weather, which breaks the veſſels interwoven with the ſubſtance of the blades and ſtem, and makes them diſcharge a thick oily juice, which, drying by degrees, is turned into that ruſty powder.

The air in England is ſeldom ſo dry, as to exhale all the moiſture of the glutinous exſudations, and thereby convert them into the ruſty powder above deſcribed. The extravaſation of the ſap ſeems to account for this diſtemper of plants, in a much more rational manner than the thick clammy dews, which ſome of our authors ſpeak of, as falling in cloſe weather, ſtopping the perſpiration of vegetables, and hindering their juices from aſcending to nouriſh the flowers, &c.

Mr. Miller* takes the true cauſe of the mildew's appearing moſt upon plants which are expoſed to the eaſt, to proceed from a dry temperature in the air, when the wind blows from that point; in which caſe it ſtops the pores of plants, and prevents their perſpiration, whereby their juices are concreted upon the ſurface of their leaves; and that concretion being of a ſweetiſh nature, inſects are thereby attracted. Thoſe inſects finding proper nutriment here, depoſite their eggs, and multiply ſo faſt as to cover the whole ſurface of the plants, and, by corroding their veſſels, prevent the motion of the ſap. He thinks it very probable, that the excrements of theſe animals may enter the veſſels of plants, and by mixing with their juices, may ſpread the infection all over them; for it is obſervable that, whenever a tree has been greatly infected with this mildew, it ſeldom recovers in two or three years, and many times is never intirely clear from it after. But he by no means allows theſe inſects to be the firſt cauſe of this diſtemper, as ſome have imagined.* It is obſervable, that mildews and blights frequently attack only one ſort of corn, or fruit, and leave the other ſpecies unhurt.

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* Gardener's Dict. Article, *Mildew.*

There have never been any effectual remedies diſcovered for this diſtemper. I find one mentioned in the fourth volume of the Bath Society's Tranſactions, page 282; which is, to allow the corn to ſtand about three weeks or more after the uſual time of cutting. For it is imagined, that this infection is owing to ſmall inſects falling on the ſtalks in foggy or miſty weather, which cauſe the ſtalk to ſwell, and the knots of it to cloſe; by which means the ſun which ſhould go to nouriſh the grain is prevented; and by letting it ſtand uncut, the ſun and air deſtroy theſe inſects; the knots re-open, and the ſap riſing as before, feeds the grain; which by letting it ſtand a proper time, will recover and become much fuller and nearly as good in quality as if no ruſt had taken place.

There is a ſimple cure recommended by Worlidge,† who ſuppoſes the diſtemper to proceed from the thickening of the dew; which is, to have it ſhaken off from the tops of the corn, before the heat of the ſun has thickened it, by making two men go at a proper diſtance in the furrows, holding a cord ſtretched between them, and ſo carried as to bruſh the tops of the plants. But Mr. Worlidge very ſenſibly adds, that the beſt preſervative is, keeping the ground free of weeds and ſtirring the earth frequently between the plants. He further obſerves, that the ſowing of wheat early, is doubtleſs one of the beſt remedies againſt mildews; for the corn will be well filled in the ear, before thoſe dews fall, and the increaſe will conſequently be greater.

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* Ibidem. Art. *Blight.*

† *Syſtema Agriculturæ.* C. X. S. I.

For curioſity's ſake, wheat was ſown in all the months of the year: that ſown in July produced ſuch an increaſe, as is almoſt incredible. In France, they generally ſow before Michaelmas. Bearded wheat is not ſo much ſubject to mildews as the other, its awns keeping the dew from the ear.

Of Blights.

Mr. Miller's definition of blights, taken from the obſervations of the reverend and learned Dr. Hales, ſeems to be very much the ſame with the definition of mildews which I have given above; though, from what Mr. Worlidge ſays of theſe laſt, they apparently proceed from a very different cauſe. Ignorant as we all are, of the ſecret ſources of theſe evils, I will not pretend to decide between theſe men of much experience.

I ſhall therefore proceed to give ſome account of the different kinds of blights, as they are divided by M. du Hamel.

Of Empty Ears.

Empty ears is, when the ears inſtead of being full of plump grains thoughout their whole length, are deſtitute of any at their ends, and contain only a few ſmall grains, in which there is ſcarce any flour, and which paſs through the ſieve with the duſt and ſeeds of weeds.

This accident muſt be owing to ſeveral cauſes.

Heavy and cold rains when the corn is in bloom, may hinder the grains from being impregnated. Some have aſcribed this evil to lightning. Others have alleged that the ears when young are hurt by froſt; and if, ſays M. du Hamel, the vegetation of a plant is damaged or interrupted by any cauſe, the grains in the point of the ear, which are formed laſt, muſt ſuffer moſt. The beſt cultivated corn is therefore leaſt liable to this accident.

Of Parched and Shrivelled Corn.

Parched and ſhrivelled corn is, when its grains, inſtead of being plump, ſmooth, and full of flour, are wrinkled in their ſkins. Theſe yield indeed good flour; but the quantity is ſmall in proportion to the bran, which is full as great as that of the beſt wheat. However, if this diſtemper does not prevail to a very great degree, theſe grains, though parched or ſhrivelled, ſprout very well and are good for ſeed.

This defect is certainly owing to ſome accident which hinders the free aſcent of the nutritive juices into the grain, when it is almoſt formed. The grain thus hurried on to maturity before its mealy part is perfected, muſt infallibly be parched and ſhrivelled. Several circumſtances may produce this hurtful effect.

If the corn is beaten down and laid, while the grains are in a milky ſtate, the broken or bent ſtalk ceaſes to convey the neceſſary nouriſhment to the ear, and the grains ripen ſuddenly without being filled: ſometimes there is no flour in them; and in either of theſe caſes they are parched. Late corn, and that which has had too much moiſture, are the moſt liable to this accident.

Mr. Tull ſays, that in cold countries, there are inſects which by pricking the ſtems of the wheat, intercept the courſe of the ſap, and occaſion this diſtemper.

Of Glazed Corn.

Amongſt the diſtempers which affect wheat, this defect, of no great conſequence in itſelf, diminiſhes a little the quality of the grain that has it, and conſequently lowers its price, eſpecially in plentiful years, when buyers are apt to be nice.

Men ſkilled in wheat require that it be heavy, of a ſmooth ſurface, and of a bright colour. If it be of a dead white, they judge that it has been waſhed, and have therefore ſome reaſon to reject it: and if it be of a deep yellow and inclining to be tranſparent, they call it *glazed* wheat, and are not ready to purchaſe it. This defect happens to corn that has been ripened by great heats, which have come on juſt before the ear was quite formed.

This glazed corn ſprouts very well, yields plenty of good flour, and makes good wholeſome bread. Mr. Liſle obſerves, that the preference to fine yellow coloured wheat in the market is not at all an ideal one, but proceeds from the uniformity between the colour of corn and its weight; for the beſt coloured is always heavieſt, being the beſt filled and plumpeſt grain.

Abortive, or Rickety Corn.

Mr. Tillet mentions abortive or rickety corn as a very fatal diſtemper. It ſhows itſelf long before the ripening of the corn, and even when the plants are not above a ſoot high. The marks which characteriſe it are, a deformity of the ſtem, of the blades, of the ear, and even of the grain.

Abortive plants do not grow ſo tall as ſound ones of the ſame age. Their ſtem is crooked, full of knots, and in ſhort rickety. Their blades are commonly of a blueiſh green, and curled various ways: their ears retain but little of the natural ſhape; they are meagre, dry, withered, and preſent but very imperfect beginnings, either of the coverings, or of the grain.

All theſe ſymptoms do not unite in the ſame plant, unleſs the diſtemper be at the worſt. Frequently, the ſtems are pretty ſtraight, the blades not much curled, and the cheſts tolerably well formed; but inſtead of incloſing a ſmall white downy embryo at their ſummit, they cover only a green grain, terminated in a point, and ſhaped almoſt like a pea beginning to form in its pod.

Theſe abortive grains have often two or three very diſtinct points, which make them look as if two or three grains were joined together at their bottom. When theſe grains have attained their maturity, or rather when they are grown dry, they turn black, and look ſo like the ſeeds of cockle, that many farmers who are unacquainted with this diſtemper, confound the abortive grains with the ſeeds of that plant.

Mr. Tillet gives a very diſtinct account of the various ſymptoms of this diſtemper, which he ſuſpects to be occaſioned by inſects; and ſays, he has perceived on the diſtempered ſtalks, where he found inſects, ſmall drops of a clear liquid, which he takes to be extravaſated ſap.

Of Barrenneſs of Corn.

The laſt diſtemper which I have to ſpeak of is that which Mr. Aimen calls barrenneſs. The ears of wheat, ſays he, and alſo thoſe of rye, are in this caſe, longer than they would otherwiſe be, lank and white: in ſome the membranes are dry, tranſparent and tough; the female organs are ſmaller, whiter, and more downy than in ſound ears: in others the veſſels are ſwelled, and all the parts are imperfectly formed. Mr. Aimen thinks, as Theophraſtus did, that theſe accidents happen to thoſe plants that grow with moſt vigour: for in them, ſays he, the too great quantity of ſap in the blades, or other parts of the plants, prevents the bloſſoms from being duly formed.

He thinks alſo that the froſt may occaſion this accident, by affecting particularly the female organs; and he is of opinion, that a ſudden ſcorching heat of the ſun, immediately after a heavy rain, may produce the ſame effect. If ſo, this diſtemper may be claſſed with that which renders corn parched or ſhrivelled, and perhaps too, not improperly, with that of empty ears. According to the ſame obſerver, inſects are but ſeldom, though they are ſometimes, the cauſe of the diſtemper here ſpoken of.

Count Ginanni, judging that the barrenneſs of corn is often owing to the poorneſs of the ſoil, rightly adviſes in this caſe, to enrich the land and change the ſeed.

SECTION II.

Of Inſects, and other Animals.

AMONG the quadrupeds, birds, and vermin which do miſchief to the ſtanding corn, hares and rabbits are accounted the moſt hurtful: rabbits are particularly miſchievous, ſo that the farmer can ſcarcely have a corn-field worſe ſituated than in the neighbourhood of a warren. In hard winters they will go a great way to feed on green corn.

Moles are very pernicious enemies to all huſbandry, by looſening the earth and deſtroying the roots of corn, graſs, and other vegetables. There are various kinds of traps contrived for deſtroying theſe vermin, and there are alſo people who make a trade of catching them, and of clearing grounds of them; while others, watching their motions morning and evening, dig them out with a ſpaddle; and, about March, which is their time of breeding, numbers of their young ones may be deſtroyed, by turning up their neſts, which are generally in the greateſt hills; and the old ones, who come to ſeek their young, are eaſily taken.

Every countryman is ſenſible of the great injuries done by rats and mice; not only to the corn laid up in ſtacks, barns, and granaries, but alſo to that in the field, where theſe vermin, and particularly the field mice, multiply to ſuch a degree in ſome places, that it is hardly poſſible to deſtroy them. The means of hindering them from preying upon corn in the ſtack, have been already pointed out, and the means of guarding againſt them in barns and granaries, will be noticed hereafter.

As to birds, it is generally allowed, that rooks and ſparrows deſtroy much more corn than pigeons; though theſe are alſo very miſchievous. Rooks are undoubtedly very hurtful at ſeed time, by pulling it up while young, and alſo by feeding upon it at harveſt. They do moſt harm, when the ſnow is firſt going off from the green wheat, towards the end of winter: for, having been pinched for food during that ſeaſon, they then greedily pluck up the young plants, in order to come at the remainder of the ſeeds ſtill adhering to their roots; and are greatly aſſiſted by the looſe ſtate of the earth at that time.

Among the many contrivances to frighten them away, Mr. Tull ſays, he has found it moſt effectual to throw up a hat, or toſs a dead rook up in the air. To ſhoot ſome and hang them on the branches of neigbouring trees intimidates them much. When the earth is turned up around the trees where they have built their neſts, they will immediately forſake them, and will not return till the graſs is grown again. Mr. Liſle ſays, that taking down their neſts and burning them with their young under the trees they were built in, will make all the old ones deſert the place. However, it has been doubted, and perhaps with reaſon, whether they do not, upon the whole, compenſate pretty fully for the miſchief they do to corn, by deſtroying vaſt quantities of grubs, worms, and other pernicious inſects, in the ſpring.

Sparrows, though but ſmall, are a very numerous body of enemies, and make ſad havock among the corn at harveſt time, eſpecially near hedges and villages. Bearded wheat, barley, and rye, are leſs their prey, than any other grain: a circumſtance which may be worth the farmer's attention, in places where his land lies near their uſual haunts; for it is better to have a full crop, even of rye, than to have half a crop of wheat eaten by them, after it has been raiſed with great care. As they are eaſily allured to any particular ſpot baited for them, at the time their food is ſcarce abroad, dozens of them may be taken at once, with the large folding ſparrow-net.

Partridges, I believe, do no great harm, as they only nip off the tips of the young blades of corn, without ſcratching or digging for the ſeeds, and conſequently are not very hurtful.

Pigeons, on the contrary, do a great deal of miſchief, particularly to peas and vetches, of which they have been known to carry off vaſt quantities at ſeed time. As it is unlawful to kill them, the only way is to frighten them, by firing powder only, or by a rattle, or ſome ſuch noiſe.

Mr. Mortimer recommends, as a method of hindering birds from eating new-ſown corn, to ſprinkle lime or ſoot upon it: and he rightly obſerves with Mr. Worlidge, that moiſt and warm lands, which are uſually the moſt fertile, are the moſt ſubject to vermin in general.

Ants and piſmires, which are reckoned among the peſts of the field in hot countries, ſuch as Italy, Spain, and the Weſt-Indies, do much leſs injury here to corn fields, than to paſture lands and gardens.

Theſe, together with ſnails, ſlugs, grubs, or large maggots, worms, and all the more diminutive tribes of inſects, are beſt deſtroyed by quick-lime and frequent plowing.

Grubs and worms are very prejudicial to land, by eating the roots both of corn and graſs, eſpecially when the corn begins firſt to ſhoot.

Grubs lie generally near two inches below the ſurface, and eat the roots of the graſs ſo regularly that Mr. Rack ſays he has rolled up many yards of the withered turf as eaſy as if it had been cut for a garden. They eat only the middle of the ſmall roots of turnips, but by that they kill all they bite without remedy. They live in water and are not killed by ſevere froſt. Hogs eat them greedily at firſt, but will not touch them a ſecond time. To rooks and crows they ſeem a high regale. Salt and quick-lime harrowed in, is the beſt way of deſtroying them.

Mr. Worlidge ſays, a ſtrong lye, made of the aſhes or fixed ſalts of any vegetable will not only deſtroy them, but prove at the ſame time an extraordinary enricher of the ground. Perhaps Mr. Worlidge was not aware, when he mentioned this, that the worms themſelves thus deſtroyed by the alkaline lye, are what gives more fertility than the lye itſelf, and at the ſame time they provide an animal gelatinous ſubſtance for the lye to work upon, ſo as to prevent its forcing the land too much. He thinks, that ſea water would alſo deſtroy them.

A ſmall kind of worm ſometimes gets into the roots of oats, and working upwards deſtroys all the inſide of the plant, which periſhes ſoon after.

Vermin called vine-fretters, are often found in kitchen gardens. They fix on the roots of leguminous plants, which afterwards gradually turn yellow and die. Mr. Tillet ſays, he has obſerved the ſame inſect in the roots of wheat.

The cuckow-ſpit, or ſpring-forth, as it is commonly termed, lodges itſelf principally in the joints of plants, ſeldom appears before the latter end of May, and is moſt common when rain has fallen after a long ſeries of dry weather.

M. du Hamel has frequently noticed a ſpecies of ſmall inſects, ſome a bright red, and others black, which are found in great numbers in the ears of wheat. He ſuſpected that they fed on a ſweetiſh juice, which is in the ear while green.

The inhabitants of the province of Angumois in France, ſuſtained, for a long ſeries of years, irreparable loſſes, by an inſect which began to devour their corn in the ear, before it was ripe. This inſect is moſt generally known as a butterfly, very much like the moth which preys on woollen cloths, or the falſe-moth which is found in great quantities in the granaries of all countries, and which feeds on corn.

Dr. Fordyce ſays, there are ſome inſects which infeſt vegetables when healthy, as the inſect which occaſions the ſmut or blackneſs in grain: this inſect is not deſtroyed by drying, but revives upon being moiſtened; and if ſown with the ſeeds, will be propagated over the whole field.

In my laſt ſection, I mentioned M. du Hamel's doubts about the ſmut in wheat proceeding from inſects; and I there gave an account of a curious experiment upon the ſowing of ſmutty wheat, which ſeems to amount to a proof, that this diſtemper is not infectious, as ſuppoſed by Dr. Fordyce.

Moſt inſects attack plants, in conſequence of a weakneſs in the plants themſelves; the juices in that caſe being converted into ſugar, become proper nouriſhment for and attract them; but when this happens, they afterwards hurt the plant greatly.

Each plant is infeſted by its particular inſects.

The north-eaſt wind is dreaded by the inhabitant of this country, for two reaſons; firſt, becauſe it is more piercingly cold than the wind from any other quarter, with the ſame temperature of the air, as indicated by the thermometer; and next, as it is ſuppoſed to bring with it, in the ſpring of the year, innumerable ſwarms of inſects, or at leaſt the eggs of thoſe inſects. How far this opinion with reſpect to the inſects, or their eggs, is founded on facts, ſeems hitherto to have been but little inquired into.

The idea that all living creatures proceed from eggs, or from the ſeed of other animals, has been ſo generally received, that we ſeldom think of deriving their origin from any other ſource: but if, in this inſtance, we were to conſider from whence theſe eggs of inſects come, ſaid to be imported by the north-eaſt winds; we ſhould probably find ſufficient cauſe to doubt of this origin.

Is it poſſible to imagine that Denmark, Sweden, Norway, Lapland, and other countries to the north-eaſt of us, countries ſo early attacked by ſevere froſts and ſo ſoon covered with deep ſnows, which continue till late in the next ſpring; can it be imagined, I ſay, that any thing which has the principle of life in it, can be ſuppoſed to croſs ſo conſiderable a breadth of ſea, and aſſume life at ſo early a ſeaſon as theſe animals are firſt perceiveable here? Unleſs this difficulty can be obviated in a ſatisfactory manner, we ſhould inquire whether the origin of theſe diſtinctive inſects may be rationally ſought for, from ſome cauſe exiſting in our air, and in the vegetables ſo apt to fall a prey to ſuch inſects.

The Count de Buffon is the firſt among the moderns, who has ventured to differ from this generally received opinion; and has aſſigned a probable cauſe for ſo doing. Without entering at large into his reaſoning, let us aſk with him, whence ariſe the animated appearances in mixtures of animal or vegetable matter, when infuſed in any fluid? It ſeems, ſays he, that the firſt eels that appear in paſte, are certainly not produced by other eels. By cutting them with the point of a lancet, we diſcover ſmaller eels iſſuing in great numbers out of their bodies.*

On this principle, let us attend to the ſtate of our vegetables in ſpring, and to the effects that a cold north-eaſt wind may have on them. There is no appearance of any ſuch inſects, till the circulation of the ſap in ſpring begins in the vegetables moſt likely to be preyed on by them. When the ſap is put in motion by the firſt warm weather, and the buds begin to ſwell, the ſharp north-eaſt wind checks the motion of the ſap in the capillary veſſels; and when the ſap is again put in motion by the return of warm weather, more ſap arrives at the obſtructed veſſels, where being accumulated, it burſts theſe veſſels and corrupts, thereby giving riſe to inſects; as is the caſe with the eels in paſte: and as more ſap is daily added, a matrix is formed for an innumerable race. This origin of inſects is confirmed by thoſe of different plants, being different; whereas, if they had been imported by the north-eaſt wind, there muſt, at the leaſt, have been a great ſimilarity amongſt them. That the inſects are different, from the juices of different plants, may be ſeen from diſſolving in water a paſte made of the flour of each plant.

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* Buffon's Natural Hiſtory, Vol. II. p. 322. *Paris Edition in Quarto.*

In order to corroborate this ſyſtem with reſpect to the origin of inſects in plants, I ſhall again have recourſe to the well known ſcience and accuracy of the Count de Buffon, who tells us, " That when large quantities of the organic and prolific matter are collected in ſome part of an animal, where it is obliged to remain, it there forms living creatures, which have always been regarded as real animals. The Tænia, the Aſcarides, all the worms found in the veins, in the liver, in wounds, in pus, and moſt of thoſe which are formed in putrid fleſh, have no other origin. The eels in paſte, in vinegar, and all the pretended microſcopic animals, are only different forms aſſumed by this active matter, which has a perpetual tendency to organization*".

This much, concerning the origin of inſects, I thought it neceſſary for me to mention here, as throwing ſome light upon a ſubject hitherto ſo little underſtood; and whatever utility it may be of, or to whatever farther diſcovery this may lead, I think it proper for me to ſay, that the reader is indebted for theſe hints to my much eſteemed and ingenious friend Mr. Small, who firſt communicated to me his ideas upon this intereſting ſubject.

Mr. Green, of her Majeſty's gardens at Kew, was the firſt perſon who invented a ſort of bellows, by which he blew the ſmoke of tobacco upon the inſects that infeſt hot-houſe plants, and by this method he ſucceeded in deſtroying them completely: but this mode of attack cannot be applied to the plants of an extenſive field, and therefore other remedies, ſuch as I have already mentioned in ſeveral parts of this work, muſt be reſorted to. I ſhall however have occaſion to take notice of the uſe of tobacco in another ſhape, when I come to ſpeak of the culture of hops.

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* Idem, Vol. II. p. 422 and 423.

SECTION III.

Of WEEDS.

THOUGH the drill huſbandry is doubtleſs far ſuperior to the broad-caſt method, in many reſpects, yet there is no circumſtance which gives it a more decided advantage, than the facility of weeding and keeping ground clean from every plant, except that which is ſown upon it, and is the preſent object of culture. For every vegetable that grows in a field, differing from the particular plant that is intended to be cultivated, may properly be termed a weed.

So much has already been ſaid upon the great utility of the horſe-hoe for this purpoſe, that it would be tireſome and trifling to repeat it here. But even in hand-hoeing, it gives a great advantage, by the plants being in rows, and conſequently not only cleaned more expeditiouſly and cheaper, but alſo at an earlier period of their growth being eaſier diſtinguiſhable from the weeds, than when ſcattered at random over the field. Thus, in the former way, the firſt hoeing may be very profitably given to wheat, in the month of October, but in the broad-caſt method it would be difficult, and even dangerous to venture upon hoeing till the ſpring following, when the plants are more grown, and more eaſily diſtinguiſhed from the ſurrounding weeds.

Frequent weeding is attended with ſeveral good effects; it looſens the earth round the roots of the plants, it cuts off thoſe rivals which are ſtruggling with them for nouriſhment; it opens ſpaces for the freer acceſs of air; and the weeds thus cut down, and rotting in the earth, furniſh freſh mucilage to the remaining plants. It is from the neglect of this moſt material point, that we often meet with lank half-ſtarved ears, which afford only meagre, ſhrivelled, ſpotted, unwholeſome grains, diſagreeable to the taſte, and not half ſo full of flour as thoſe of ſound corn.

The beſt time for weeding by hand is, after a gentle ſhower of rain has moiſtened the ſurface of the earth; becauſe the weeds are then moſt eaſily drawn out with their roots, which are apt to break when the ground is too dry; and in this caſe the remaining pieces, particularly of thoſe which are of the creeping perennial kind, will ſoon produce new ſhoots, which will become as hurtful as the old ones.

If the ſpring is wet and warm, and if it rains much in May, abundance of weeds will then ſhoot up; and great care ſhould be taken to deſtroy them immediately. The mild ſhowers which are ſometimes almoſt continual in June, produce the ſame diſadvantageous effect.

Then it is, particularly, that every ſpecies of the bind-weed ſhoots up with vaſt rapidity, twirls itſelf round the corn, reaches its topmoſt height in eight or ten days, and drags it down, ſo as to deprive the ears of all further ſuſtenance.

Only the warm rains in June, and not the cold ones, engender this noxious production: particular care ſhould therefore be taken to pluck up all weeds, and eſpecially this, in April, May, and June: otherwiſe there will be danger of reaping ſtraw only, inſtead of corn.

Of the perennial rooted weeds, which are beſt deſtroyed by repeated ſummer fallows, wherein it is eſſentially material that every piece of root be taken away and burnt, becauſe in many of ſuch, every joint will produce a new plant; the moſt hurtful to the farmer, and the moſt apt to abound are the

Bind-Weed, by ſome called the With-wind (*convolvulus*),

(*convolvulus*), of which, conſidered as a weed, there are two principal ſorts, the great and the ſmall. Its root is perennial, but its ſtalk annual. Mr. Liſle, after obſerving, that he believes it propagates itſelf in paſture ground, chiefly by its ſeeds, and by its roots in arable land; becauſe it ſeems to flower too late in corn, to ſeed before the corn is cut; rightly aſſigns as a reaſon, why it is moſt apt to multiply in ſtrong clayey ſoils, that ſuch ground being, in the common practice, plowed only in the winter months, after wheat, for ſuch other crops as peas, barley, or oats, and not till about September for winter vetches; this tillage cannot deſtroy the roots or ſeeds of weeds like the ſummer fallows for wheat; but on the contrary, promotes their increaſe, particularly from the off-ſets or joints of the roots.

In an open clear ſpot of ground, good plowing and harrowing, or carefully hoeing down of theſe weeds as they riſe, during three or four months, may extirpate them effectually; for when the ſtalks are broken or cut, a milky juice flows out, and the roots are thereby ſoon exhauſted and decay. The roots of this ſort are pretty thick, and extend far on every ſide.

Blue Bottle, which ſome call knap-weed, and others centaury (*centaurea*). Many of the ſpecies of this genus, of which Mr. Miller enumerates twenty, have perennial roots; but our common blue-bottle, according to him, is an annual plant. It propagates itſelf by its ſeed in corn-lands, in which it moſt abounds, eſpecially in a gravelly ſoil. From an old notion of its being good for ſcabs, ſcald heads, &c. ſome have given it the epithet of ſcabious. It flowers in July, and its ſeeds ripen in autumn.

Spatling-Poppy, or *Berry-Bearing Chick-Weed* (*cucubalus*), flowers early in the ſpring, and, if it be ſuffered to grow, ſeveral times in the courſe of the year. The way to deſtroy it therefore is, to pluck it up from time to time, before it can ſhed its ſeed. This is a very rambling weed, natural to moſt parts of England.

Its roots are perennial, and ſtrike ſo deep in the earth, that they are not eaſily deſtroyed by the plough; for which reaſon, bunches of this plant are too common among corn, in land which has been perfectly well tilled. Summer fallows and careful harrowing out the roots, will here prove the moſt effectual remedy.

Cockle (*agroſtemma hirſuta*), the ſeeds of which are black, having a white meal or flower. The ſeeds are not eaſily ſeparated from the grains of wheat, becauſe they are heavy.

Sifting and throwing the corn on a large floor, are the beſt ways of clearing the corn of theſe ſeeds.

The cockle is beſt extirpated in arable land, by ſummer-fallows, good harrowing, and carefully removing every bit of its long creeping, perennial roots, which would ſoon produce new plants if left on the ground, and ſhould therefore be burnt when taken off. The horſe-hoeing huſbandry will ſooneſt and moſt effectually deſtroy this weed.

Colts-foot (tuſſilago). This weed, which delights to grow by the ſides of rivers, increaſes ſo faſt by its ſeeds and rambling roots, every piece of which will produce a new plant, that it cannot be extirpated without much difficulty and a conſiderable time. Carefully pulling up the roots every time the earth is ſtirred, or the leaſt veſtige of the plant appears, and preventing it running to ſeed, are the moſt effectual means of deſtroying it in arable land, and is beſt accompliſhed by the horſe-hoe: but to extirpate it totally, the ground muſt be long laid down to graſs.

A neighbour of Mr. Liſle's almoſt deſtroyed it by two ſucceſſive crops of vetches; and he himſelf is clearly of opinion, that it may be killed by letting the land lie a ſufficient time under clover or rye-graſs; becauſe, ſays he, the roots of the natural graſs matting more and more every year, will in five or ſix years, ſo bind the ſurface of the ground, that the colts-foot will not be able to pierce through it, and therefore die for want of air. He plowed up broad clover in the beginning of July, and turned up the roots of colts-foot in which he obſerved between earth and air many little buds ſhot forth; probably to be the leaves or flowers for the next year; and at the depth of ſix or ſeven inches, he remarked here and there a ſhoot of a callous body, like the root itſelf, from one to four inches long, perhaps deſtined to be future roots. He experienced that a winter-fallow will not deſtroy theſe roots, and that they cannot reſiſt the effects of a ſummer's fallow, in which they are turned up to the ſun. It is therefore neceſſary to pick them up as clean as poſſible, and burn them: for it is not to be ſuppoſed, that all the roots which are turned up in a ſummer-fallow, will wither of themſelves: on the contrary, ſuch of the buds at the joints, as are buried, and even many of thoſe which only touch the ground, will ſhoot out again if much rain falls, or the ſeaſon be wet.

Corn-flag (*gladiolus*). This multiplying exceedingly by its roots is a very troubleſome weed, in arable land, and is extremely difficult to root out. The manner of extirpating it, is the ſame as for colts-foot.

Corn Marygold (chryſanthemum). Of this there are two kinds; that with leaves which embrace the ſtalks, the upper being jagged and the lower indented like a ſaw; and that which C. Bauhin names the greater wild daiſy, with a leafy ſtalk. The former of theſe is the common corn-marigold, too frequent among corn and in the borders of corn-fields. The latter, which delights more in moiſt paſtures, of which few are without it in this country, riſes with ſtalks near two feet high, garniſhed with oblong indented leaves, which embrace the ſtalks with their baſe. Each of theſe ſtalks is terminated by one white flower, ſhaped like that of the daiſy, but four times as large. It flowers in June. The corn-marigold has a perennial woody root, which ſtrikes deep, and requires a conſiderable quantity of nouriſhment, and muſt therefore be a great enemy to corn. Conſiderable pains muſt be taken before this weed can be extirpated, as it is highly probable that beſides multiplying by its roots, its ſeed will grow if plowed in, as that of the garden-marigold does. Deep and repeated hoeings are therefore neceſſary, before it runs to ſeed.

Couch, Couch-graſs, Quich-graſs, Knot-graſs, or *Dog-graſs,* as it is frequently called, *(triticum repens)* is one of the worſt of weeds among corn, and one of the worſt to extirpate in arable land;

every joint of its long creeping roots being capable of ſoon producing a new plant, even after thoſe roots have been cut and broken by the plough. The uſual method of deſtroying it is by laying the land fallow in the ſummer, and frequent harrowings to draw out the roots, all of which ſhould then be burnt, to prevent its growing again. Where this is carefully done, the ground may be ſo well cleanſed in one ſummer, that the remaining roots will not do any great injury to the crop: but the beſt way is, to ſow the land in which this weed prevails, with ſuch things as require the horſe-hoeing culture. The blade of this graſs is ſo rough, that cattle will not feed upon it when green.

Corn Scabious (*ſcabioſa arvenſis*), has a ſtrong thick fibrous root, which runs deep into the ground, and ſends out ſeveral branching ſtalks, which riſe three feet high. The lower leaves are ſometimes almoſt intire, and at others, they are cut into many ſegments nearly to the mid-rib: they are ſeven or eight inches long, and from three to four inches broad in the middle, hairy, and ſit cloſe to the root. The ſtalks are covered with ſtiff prickly hairs, and garniſhed with ſmaller leaves at each joint. The flowers, which are of a pale purple colour, and have a faint odour, appear in June, upon naked foot ſtalks at the ends of

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the branches, which decay to the root every autumn.

The Dock (rumex), of which there are ſeveral ſorts, is ſo remarkable by its large leaves, that he muſt be a very ſlovenly farmer who ſuffers it to grow to any ſize. If he is careful, he will pluck or cut it up as faſt as it appears, which he may eaſily do when the land is moiſt, it being of the tap-rooted kind.

Dyer's Weed, or Wild-Woad, by ſome called *Weld*, or *Baſtard-Racket, (reſeda)*, is a troubleſome plant, when conſidered as a weed. Its root is long, white, and ſomewhat woody; its leaves are unequally winged and intire; its ſtalks, which are channelled, and garniſhed with ſmaller leaves, riſe a foot and a half high, and are terminated by a long looſe ſpike of pale yellow flowers, which are ſucceeded by a triangular ſeed-veſſel, filled with black ſeeds. This is a biennial plant, which flowers and ſeeds the ſecond year, and periſhes ſoon after. It is obſerved to make the milk of cows bitter, and to communicate the ſame ill taſte to the butter and cheeſe. Of this genus is the woad very profitably cultivated for dying, and which will be ſpoken of more fully hereafter.

Ground Ivy (glichoma), is one of thoſe trailing plants which ſtrike out roots from the joints of their ſtalks: but as it generally grows under hedges, or on the ſides of banks, the ſalutary effects of its medicinal qualities more than compenſate for the injury it may do.

May-Weed, or Morgan, a wild ſpecies of camomile *(anthemis)*, is a trailing perennial plant, which puts out roots from its branches, as they lie on the ground; by which means, and by ſcattering its ſeeds long before corn is ripe, it ſpreads and multiplies greatly. It flowers in May, from whence its name: though ſome have improperly given this name to the *colula fœtida*, which ſeldom bloſſoms till late in June. The means of extirpating it are, ſummer fallows, repeated good harrowing, and burning the collected roots, as before directed; or, which will be found ſtill more effectual, the frequent hoeings of the drill huſbandry. What eſcapes theſe cleanings ſhould be carefully pulled up by hand, when the ground is tender; for this plant has a long ſlender tap-root, of which every remaining bit that has a knot in it, will produce new ſhoots. Nor ought the farmer to regret this ſmall additional expence to get rid of one of the moſt fatal enemies his corn can have. Mr. Liſle aſſures us, that as good a crop of wheat as one would wiſh to ſee all the winter time, was, to his knowledge, ſo deſtroyed by the coming up of May-weed and poppics in the ſpring and ſummer, that it did not at laſt yield ſo much as the ſeed.

Mugwort (artemiſia), is a moſt troubleſome weed; for its roots creep far under the ſurface of the ground, ſo as ſoon to overſpread a large ſpace, if they are not ſtopped; and its ſeeds, being light, and eaſily carried to a diſtance by the wind, will produce numbers of new plants the next ſpring. It has plain cut leaves, woolly underneath, and ſingle ſpikes of plain yellow oval flowers, which blow in June.

Mullein (verbaſcum), is a biennial plant, which periſhes ſoon after it has perfected its ſeeds. The lower leaves of the common ſort, which is the ſpecies here ſpoken of as a weed, though it be that which is uſed in medicine, ſpread on the ground, are nine and ten inches long and ſix broad, very woolly, of a yellowiſh white colour, and have ſcarce any foot ſtalks. The ſtem riſes four or five feet high, and the upper part of it is garniſhed with yellow flowers, which ſit very cloſe, and form a long thick ſpike. Theſe flowers have an agreeable odour. They appear in July, and the ſeeds ripen in autumn. This plant is moſt common by the ſides of high-ways, and on banks; but if it once gets into fields in a warm expoſure, and is ſuffered to ſeed there, it will ſoon over-run the whole ground. It may eaſily be deſtroyed by cutting off the ſtem when it is in flower.

Nettle (urtica). The largeſt ſort of this well known ſtinging weed is perennial, and the ſmaller ſort is annual. Tolerable good cordage has been made of the threads or filaments of this plant, treated as hemp. They are ſtrong and tough, and certainly afford great room for further improvements of that kind, well deſerving the attention of the curious who direct their views to objects of public utility. Cutting it up by the root before it can ſeed, is the way to deſtroy it.

Silver-Weed or Wild Tanſey (potentilla), is a ſpecies of cinquefoil, which grows naturally on cold ſtiff land in moſt parts of England, and is a ſure mark of the ſterility of the ſoil. Its ſtalks ſpread upon the ground, and ſend out roots from their joints; by which means, and by the frequent ſhedding of its ſeeds, for it flowers during the whole ſummer, it ſoon over-runs and fills the land to a great diſtance.

The leaves of this plant are compoſed of many lobes or wings, which are generally placed on the mid-rib, and terminated by an odd one: they are jagged at their edges, and are of a ſilver colour, eſpecially on their under-ſide. The way to deſtroy this kind of growth has already been pointed out. Mr. Ray ſays, that the root of wild tanſey, which is ſomewhat of the parſnep kind, is good to eat, and that hogs are very fond of it.

Thiſtle, (carduus). The Engliſh thiſtles meriting notice, as more or leſs noxious, are,

1. The *Carduus Lanceolatus*, or Spear Thiſtle.
2. *Carduus Nutans*, or Muſk Thiſtle.
3. *Carduus Paluſtris*, or Marſh Thiſtle.
4. *Carduus Marianus*, or Milk Thiſtle.
5. *Carduus Acanthoides*, or Welted Thiſtle.
6. *Carduus Criſpus*, or Curled Thiſtle.
7. *Onopeidum Acanthium*, or Cotton Thiſtle.
8. *Scratula Arvenſis*, or Curſed Thiſtle.

Of theſe, all except the laſt, are either annual or biennial, that is, remain in the ground not more than one or two years, unleſs renewed by ſeed. The laſt having a perennial root, continues in the earth increaſing, and throwing up new ſhoots every year.

Hence it will appear obvious, that if the firſt ſeven ſpecies of thiſtles, are cut down before they perfect their ſeeds, the ground will be intirely cleared of them; and that the laſt mentioned can no otherwiſe be deſtroyed than by rooting it out.

It is more general in its growth than any one of the others, being found not only by the ſides of roads univerſally, but alſo in arable land; and is not uncommon in meadows, even in ſuch as are yearly mown. It is remarkably prickly, grows about three feet high; its heads are ſmall, the flowers purple, and frequently white. The ſcales of the heads are ſmooth, and it may in a particular manner be diſtinguiſhed from all the others, by having a perennial root about the ſize of a gooſe-quill, which runs deep into the earth, and afterwards creeps along horizontally.*

Wherever thiſtles grow naturally, it is a ſure ſign the land is ſtrong: but at the ſame time they are a great annoyance to every plant intended to be cultivated.

The beſt way to deſtroy them is to cut them up by the roots before ſeeding time, which is in autumn; for cutting of them too young, will only make them branch the more: or to pluck the thiſtles up by hand, when the ground is moiſt and tender. They may then be eaſily drawn up with their roots, by uſing a glove made of hard leather.

Mr. Arbuthnot effectually deſtroyed them by another method: he having obſerved that rolling in the ſpring while the land is wet was fatal to the crop of graſs, determined to try its effect upon the thiſtles; he did ſo accordingly, and the effect was ſo great, that after that operation ſcarcely one thiſtle appeared, but the crop of hay, where they were, was ſpoilt. Rolling in dry weather had not the ſame effect.

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* Mr. William Curtis in Bath Soc. Tranſ. Vol. I. p. 100.

Mr. Winter, in his Compendium, ſays, thiſtles may be deſtroyed by cutting in the ſpring and ſowing wood-aſhes over the bleeding wounds: perhaps hot lime might be more effectual.

Of the weeds propagated by their ſeeds, which ripen either before, or with the corn, and which ſow themſelves, or are gathered with it, the following are moſt to be feared.

Darnel-Graſs (lolium). There are two ſpecies of this graſs, one perennial, which is moſt commonly found by the roads, or in paſtures; the other is found in arable land, where it grows to a great height, bears a ſeed nearly as large as wheat, which it reſembles, and is therefore difficult to ſeperate from the corn. This however ought to be done as carefully as poſſible, as it diſcolours the flour, and gives a diſagreeable taſte to the bread. Theſe ſeeds are ſaid to be of a very intoxicating quality and if taken in large quantities will bring on convulſions.

This weed is extirpated by fallows, and the horſe-hoeing huſbandry.

Chickweed (alſine), though but an annual plant, will ſoon become very troubleſome if it be ſuffered to ſtand till it ſheds its ſeeds, which Mr. Liſle thinks it does ſeveral times in the year: for he obſerved on the 23d of October a great deal of this weed, the branches of which carried many buds of bloſſoms, many flowers full blown, and many pods with white ſeeds almoſt ripe; ſo that its increaſe can be the leſs guarded againſt by any ſort of huſbandry in the common way. The repeated horſe-hoeings in the new huſbandry muſt here be attended with great advantage; at all events particular care ſhould be taken, to prevent the ſeeding of this plant upon dung-hills, where it is too often ſuffered to grow unnoticed, and undiſturbed; for its ſeed ſcattered there and intermixed with the dung will ſoon give birth to a multitude of weeds in the land on which it is ſpread; unleſs the dung be kept till the ſeeds are rotted and have loſt their vegetative power.

Charlock (ſinopis arvenſis), the young plants of which are ſo very like thoſe of young turnips, as not eaſily to be diſtinguiſhed but by the taſte; the charlock being hot and bitter, and the turnip mild.

Mr. Liſle obſerves, that cold wet lands are more ſubject to charlock, than white land; becauſe, ſays he, the charlock ſeed, being very oily, reſiſts putrefaction, and is not eaſily opened or penetrated by moiſture; whereas white and light earth is ſoon dry after rain, and the water does not continue ſo long as to make ſuch ſeed germinate ſo effectually as in the other. Mr. Mortimer mentions his having been told, that a farmer who had vaſt quantities of this weed in a field of barley, mowed the whole, when the charlock was in flower and ready to ſeed, which is commonly about the middle of May, as low as he could, without taking off more than juſt the tops of the blades of barley, and that this killed the charlock and gave the corn an opportunity of getting above it in ſuch a manner, that he had four quarters of barley on an acre. He adds, that where a fallow is full of charlock, it will be right to turn in ſheep, for that they will eat it very readily. I have heard, that it was common in Holſtein to give charlock to horſes, either green, dried, or its ſeed mixed with oats; that then cattle are fond of it, and that it is found to be very hearty food.

Cow-Wheat (melampyrum), by ſome called Foxtail, is a pernicious weed in many countries. Its ſeed is ſomewhat like wheat, and is ſaid to ſpoil the meal with which it is ground, by giving it a dark colour and bitter taſte.

Mr. Miller ſays, it is delicious food for cattle, particularly for fattening of oxen and cows, and that it may be worth while to cultivate it for this purpoſe.

Its ſeeds ſeldom grow the firſt year, unleſs they chance to be ſown, or to ſow themſelves in the autumn, ſoon after they are ripe. It is a large plant, bearing a ſpike of purple flowers, with numerous floral leaves of the ſame colour. This is not a common weed in arable land, but is frequently found in mountainous paſtures and woods.

Fennel-flower (nigella), and *Fenugreek, (tregonella),* abound in warm climates, but are not very common here.

When they are found, they may be rooted out before they ſeed.

The Groundſil, (Senecio Vulgaris) is a ſmall annual plant, ſeldom viſible during more than two or three months in the year.

It comes to maturity in about a month, ſows itſelf and dies; ſo that like all other weeds of this claſs, whoſe ſeeds ripen before or with the corn, or which ſow themſelves, it is eaſily extirpated by preventing its ſeeding.

Hare's-foot Trefoil (trifolium arvenſe), abounds moſt in dry gravelly land, and is a ſure indication of the ſterility of the ſoil; for it is rarely ſeen on good ground. It is an annual plant, whoſe root decays ſoon after it has perfected its ſeed; and ſo coarſe that cattle ſeldom eat it. Another ſpecies of trefoil, which is apt to infeſt arable land in many parts of England, is diſtinguiſhed by the name of *Strawberry Trefoil,* and has trailing ſtalks which put out roots at their joints. The leaves ſtand upon long ſlender foot-ſtalks; the lobes are roundiſh and ſawed on their edges ; the flowers are collected in roundiſh heads, ſtanding on ſlender foot-ſtalks, which riſe from the wings of the ſtalks ; and theſe have bladder empalements which terminate in two teeth. When they lie on the ground, their globular head, having a little bluſh of red on their upper ſide toward the ſun, and the other part being white, they look not unlike ſtrawberries ; and from thence this kind derives it particular name.

Melilot, (*Melilotus*) commonly uſed in medicine, is of the trefoil kind, and grows in ſuch abundance among the corn in many parts of England, particularly in Cambridgeſhire, as to be a moſt troubleſome weed ; for it is hardly poſſible to ſeparate it from the corn in reaping, ſo that they are houſed together, and the ſeeds of the melilot, which ripen about the ſame time as the corn, are threſhed out with it, after which, they being likewiſe heavy, it is very difficult to ſeparate them. If but a few of theſe ſeeds are ground with the corn, they will ſpoil the flour, for the bread or whatever elſe is made with it, will have a ſtrong taſte and ſmell like melilot plaiſter. The roots of this plant are ſtrong and woody, and from them ſpring ſeveral ſtalks, which riſe from two to four feet high according to the goodneſs of the land. Theſe ſtalks branch out, and are garniſhed with trifoliate leaves, having oval ſawed lobes of a deep green colour. The flowers are produced in long ſlender ſpikes, which ſpring from the wings of the ſtalks. They are of a light yellow, ſhaped like the other butterfly flowers, and are ſucceeded by naked ſeeds, which ripen in Auguſt.

Corn Spurrey (ſpergula arvenſis), is a common weed in many parts of England. It ſeldom riſes above ſix inches high, flowers in the beginning of July, ripens its ſeed in Auguſt, and is an annual plant. The way therefore to extirpate it is, by ſummer fallows, and cutting off before it can ſcatter its ſeeds, which are very ſmall. Two ſpecies of this plant are cultivated in Holland and Flanders for the winter food of cattle, when there is a ſcarcity of graſs. It is ſaid to enrich the milk of cows, ſo as to make it afford excellent butter; and the mutton fed on it, is frequently preferred to that which has been fed on turnips. Hens too eat this plant greedily, and it is commonly thought to make them lay an extraordinary number of eggs. From the ſhortneſs of its growth, this plant cannot afford a great quantity of fodder; but as it will grow on the pooreſt land, where no other graſs will thrive ſo well, it may be cultivated to good advantage in many places; and by feeding it off the ground, the dung of the cattle will improve the land. The people in the Low-countries commonly ſow it twice a year; the firſt time in April or May, to be in flower in June and July; and the ſecond time after rye-harveſt, to ſerve their cattle in November and December. The uſual allowance with them is, about twelve pounds of ſeed to an acre of land.

The great advantage of ſpurrey as fodder is, that it requires no preparation in the land, but harrowing, then ſow the ſeed in a rainy day, buſh-harrow, and it will ſhoot up on the fourth day.

Wild-garlick, Crow-garlick, or Cow-garlick, as ſome call it (*cepa*), will do great damage to corn in dry ſandy grounds, but will not grow in clays, according to Mr. Liſle, who mentions a farmer, in ſome of whoſe fields it grew in ſuch abundance, that his wheat taſted ſtrong of it, and was thereby damaged from ſix-pence to a ſhilling in the buſhel.

Wild Oats are difficult to be extirpated, when they have once taken poſſeſſion; for ripening before harveſt, and ſcattering their ſeeds around them, they will remain in the ground till it is plowed up again, though it be for a whole year; ſome ſay four or five years, and will then come up with the corn. The ſureſt way to deſtroy them is to lay the ground down to clover, and to mow the oats and clover together, before the oats are ripe. Their roots will not ſhoot out again.

Wild-poppy, or red weed (papaver erraticum), common in almoſt all arable lands, but moſt ſo in the lighteſt. It is an annual plant, which ſometimes multiplies ſo prodigiouſly by its ſeeds, that it choaks the wheat among which it grows. There are three kinds of this poppy, a red, a deeper red, and a copper-coloured, all of whoſe flowers are ſucceeded by oblong prickly heads, filled with ſmall black ſeeds, which ſow themſelves if they are ſuffered to ſtand.

Wild vetches (vicia ſegetum), are great enemies to corn wherever they prevail, and eſpecially if it happens to be lodged; for they then ſoon get above it, keep it down, and thereby contribute greatly to its rotting. Too much care cannot be taken to extirpate them, by preventing their ſeeding.

Black-bent, in ſome places called *mouſe-tail*, is more difficult to extirpate than many other annuals; but Mr. Arbuthnot found the following method very effectual. Plow up the ſtubble in September, and leave it for the winter: in ſpring, pulverize the land, as ſoon and as fine as poſſible; ſo let it remain for the bent to vegetate; then plow it up and ſow ſummer tares, or any thing that comes off ſoon enough to leave time for plowing it well before winter. Lay it up on the ridge, to be ſecure from rain: if the black-bent ſprings again, plow the whole ſurface of the land with the ſhim, after which harrow, and leave it for ſowing wheat under furrow, ſhallow and very late. This method is alſo good for the deſtruction of all ſeed-weeds, if no couch is in the land: drilled crops, by admitting the hand-hoe, are excellent for deſtroying this weed.

Weeds are very different in their natures. Some, if prevented from vegetating, die in a few years, by lying moiſt in the earth; others will lie many years in this ſituation, without loſing the power of vegetating.

The firſt kind may be deſtroyed by laying down the land to graſs for five or ſix years; and both kinds may be rooted out by allowing them to vegetate, and then tearing up the young plants before they begin to flower. In order to promote the vegetation of weeds that are intended to be deſtroyed, the land ought to be well plowed; if a little dung or other manure be applied, the crop of weeds will be increaſed, and their deſtruction will be rendered more general.

Several weeds, as the thiſtle, dandelion, ragweed, &c. are furniſhed with a kind of down, by which they float in the air and are carried to great diſtances by the wind. Farmers ſhould be as careful to root out all weeds of this kind from hedges, banks of fences, and brows, &c. as from their arable land; for though they appear inoffenſive in thoſe ſituations, they are tranſported from thence in great quantities into the adjacent fields, by the wind.

There is another great ſource of weeds, but too little attended to by farmers, at which I have already hinted. It is a general practice, to throw the ſeeds that are ſeparated from the corn in winnowing, upon the mixen; by which means they are carried out with the dung, and again ſown upon the land.

There are many different kinds of weeds that are propagated by the roots, as I have already taken occaſion to remark. Some of them infeſt land that is in tillage, and others land that is in graſs.

Thoſe that infeſt land in tillage, may be deſtroyed by laying down the land to graſs for ſome years. This is thought the moſt effectual way of rooting out the couch-graſs and other weeds of the ſame nature. If the ſoil be ſtiff and ſtrong, it will be the ſooner cleared by this method. But a ſoft ſpungy ſoil will require to be in graſs for ſix or ſeven years, before the weeds are deſtroyed.

Thoſe weeds that infeſt lands in graſs, are eaſieſt deſtroyed by tillage. Neither is it neceſſary to continue it long in this ſituation; for the weeds ſoon diſappear by this treatment.

In ſome caſes, however, it may be inconvenient to change the ſtate of the land from tillage into graſs, or from graſs into tillage. It is therefore neceſſary to conſider, whether the deſtruction of the weeds may not be accompliſhed without theſe operations.

When land is in tillage, the weeds may certainly be deſtroyed by ſummer fallowing, plowing deep, and carefully carrying off the trumpery, that it may not again ſtrike root.

When it is intended to clear land of ſeed-weeds, the ſurface cannot be made too ſmooth; becauſe it will encourage them to vegetate. But when root-weeds are to be deſtroyed, land cannot be laid too rough, becauſe the drought has the more eaſy acceſs to thoſe roots which are to be dried and withered.

When graſs lands are infeſted with weeds, the beſt way to deſtroy them is by frequently cutting, or pulling them up by the roots. Some lands, particularly damp ſoils, after being in graſs for years, are apt to be over-run with moſs. In this caſe, rolling will be of great uſe, by making the ſurface firmer. This weed, like many others, may be deſtroyed by depriving it of air. This is beſt done by manuring well, for the graſs will then riſe above and choak it.

SECTION IV.

Of FALLEN, or LODGED CORN.

THE fineſt, talleſt, and ſtrongeſt plants, are not always thoſe which yield the greateſt quantity, or beſt grain. The ſtems of corn grow and ſhoot up pretty perpendicular, unleſs this order of nature is ſubverted by ſome accidental cauſe. The moſt frequent cauſes of this kind, are wind and rain. The ſtem, which is ſupple, bends indeed, and thereby gives way to the force of the wind; and by means of its elaſticity, it recovers its erect poſition upon the ceaſing of the wind, having received little or no injury: but when much rain accompanies the wind, the ears of the corn become loaded with wet, and the ſtalks, which are tender near the ground, break: the plants cannot then riſe up again; and if there be weeds at the bottom of the ſtems, they will ſoon top the corn, and effectually prevent its riſing. If the accident of their being lodged and broken, happens ſoon after the ears have done bloſſoming, the grains, which then receive but little nouriſhment, remain very ſmall, and contain little elſe but bran. In this caſe the loſs becomes very conſiderable; for, beſides the injury ſuſtained by the grain, the very ſtraw rots, and is rendered unfit for the food of cattle.

If the corn be not lodged before it is almoſt ripe, the grains will then be only ſhrivelled, and a tolerable crop may be reaped, if the time of harveſt proves warm and dry; but if it be rainy, ſuch corn will be very apt to grow in the ear.

Laſtly, if too high winds happen when the corn is ripe, its grains will ſhed, and its ſtalks will be entangled, to the great detriment of the farmer, and to the no ſmall trouble of the reaper, however careful both of them may be. Corn only bent riſes again. In this ſituation, the plants continue to grow, their ears increaſe, and become full of grain, which ſometimes is not even ſhrivelled. What is moſt to be feared, is that birds may perch upon it, in this ſituation, and by their weight may contribute to lodge the plants. Were it not for this, the bending might even be of ſervice to it, becauſe wet cannot get into the ears, and their grain will be fitteſt for keeping. The bent ears will alſo be leaſt liable to be ſhaken by the wind: the greateſt danger is their bending more and more till they reach the ground, and, by lying moiſt, begin to ſprout.

If the huſbandman could foreſee when a ſeaſon is to be very favourable for the growth of corn, which is not, indeed, the lot of humanity, he would doubtleſs forbear to enrich by manure his already good land, and thus prevent an over exuberance of growth, and a tendency to lodge. In the year 1761, the low corn produced finer and better grain, than the talleſt and at firſt moſt promiſing.

As ſoon, therefore, as the farmer perceives this approaching evil, he thinks of two ways of preventing it; either by mowing down his crop, or by turning in ſheep to eat down the too luxuriant blades: but both methods are dangerous, and ought only to be exerciſed in caſes of great neceſſity, and even then with much caution. The farmer, by theſe means, runs a great riſk of leſſening his crop, or reducing it to the level of a ſecond growth, where the ears are always ſmall and light. Beſides this, the grain is better when it ripens early in the ſeaſon; but by checking the growth, and retarding the ripening, corn is thus expoſed to all the inconveniencies of a late harveſt.

It is agreed, that corn which grows in a rich ſoil is taller, and more liable to be lodged, than that which is ſtunted in its growth. But this is owing to the weakneſs of the ſtraw, and not to the weight of the ears, let them be ever ſo full of grain. The buſineſs therefore is, to give the ſtems as much ſtrength as poſſible. To this end, it is neceſſary that the ſun and air have free acceſs to them, and that the plants receive ſufficient nouriſhment while in the earth; for we frequently ſee tufts of wheat, which chance to grow ſeparate from others, and ſtand in ſuch a manner as to be expoſed on all ſides to the influence of the air and of the ſun, much leſs apt to be laid than thoſe which grow in the middle of large fields of corn. In the common huſbandry, the plants generally have but a ſcanty portion of food; and as their ſtalks ſtand cloſe together, ſmothered and ſtifled as it were, they are ſlender and brittle: but in the new huſbandry, where they receive abundant nouriſhment during the whole time of their growth, and are always expoſed to the air and ſun, the ſtalks become large and ſtrong enough to ſupport the ears. Many experiments in this huſbandry have likewiſe proved, that the turning the earth towards the roots of corn at the laſt hoeing, contributes greatly to give ſtability to the ſtems after they have attained their height, and renders the corn leſs liable to be lodged.

M. du Hamel had a remarkable inſtance of this in the year 1750, when a field of his ſowed in rows and cultivated in the new way, which made the wheat there grow very tall, and rendered its ears uncommonly large and full of grain, eſcaped unhurt; whilſt the corn was beaten down in moſt of the neighbouring lands.

It will not, I flatter myſelf, be thought an improper digreſſion in this place, to take a curſory view of the œconomy of plants, from which we ſhall ſee more clearly the uſes and properties of their roots and leaves, how they contribute to their nouriſhment, and how neceſſary for that purpoſe, is the free admiſſion of rain, air, and ſun.

The principal veſſels of plants are of two kinds, *Tubes and Cells.*

The Tubes run from the roots to the different parts of the plant, in ſeparate bundles, communicating with one another, but not joining and branching as in animals.

Theſe tubes contain principally the mucilagenous and ſaccharine juices, ſerving for the nouriſhment of the vegetable. The tubes, being capillary, if empty and immerſed in water, or any other fluid, have a power of filling themſelves by the attraction of the fluid to their ſides; but this will not by any means account for the circulation in vegetables; there is therefore a power, ſimilar to the muſcular power in animals, by which this motion, at leaſt in part, and all the other motions of vegetables, are performed.

The Cells contain the peculiar juices of plants; and moſt probably theſe are formed in them by fermentation: they communicate with the tubes, or rather, the tubes terminate in them.

In the root of a plant, the cells ſurround the tubes, which are only open at the extreme points of the fibres, and fluids cannot be abſorbed by them any where elſe. The tubes are not ſimply open at the ends of the fibres, but there is a particular configuration which adapts them to abſorb fluids; ſo that if the ends of all the fibres of the roots of any vegetables be cut off, the growth of that vegetable is ſtopt, till freſh fibres are formed.

Unleſs there be a number of fibres in the root, a plant will ſeldom flouriſh; inaſmuch as a ſufficient quantity of nouriſhment cannot be abſorbed.

More numerous fibres may be made to break out by a ſufficient tenacity of the ſoil; by richneſs of ſoil; by cutting the fibres, in which caſe they do not go on, but branch out into new ones; by poiſoning the weak fibres, and by cutting the branches.

But the fibres are rendered too weak for the ſupport of the plant, by too great tenacity of the ſoil; by applying poiſon in too great a quantity, and by cutting the branches too much.

As roots can only abſorb nouriſhment from the points of their fibres, the cells ſurrounding them ſerve to defend the tubes from water, which they do if the ſoil be moderately dry; but in very moiſt ſoils, the water ſoaks through to the tubes, ſtops the circulation in them, and rots them. The roots of ſome plants will bear a much greater quantity of moiſture than thoſe of others.

In trees and ſhrubs, the ſtems which are above a twelve-month old are to be conſidered as roots, having the ſame ſtructure.

At that part where the root is converted into a ſtem, the tubes divaricate and are placed on the outſide; being covered only with a thin bark, which is of the ſame texture and anſwers the purpoſes of the leaves; the cells forming the pith being contained in the middle.

Water conſtantly evaporates from the leaves and the bark of the ſtem, and carries along with it the volatile parts of the juices, and ſome ſmall portion of the more fixed; but they attract water from the atmoſphere at the ſame time, ſo as in ſome caſes to nouriſh the plant totally; and the roots alſo throw out a part of the juice into the ground. There is a conſiderable difference betwixt that which evaporates into the air, and that which exſudes into the ground; as the former contains water, with the eſſential oil of the vegetables; and the latter, the mucilagenous juices.

The exſudation from the roots takes place in the greateſt quantity while the leaves are flouriſhing; hardly any thing flowing out after they begin to decay. Secondly, in plants that are moderately ſucculent; and thirdly, in perennial plants, at the time of the flowing of the ſap.

Seed conſiſts of the huſk, a membrane covering the other parts; of the cotylidons and one, two, or three maſſes of farinaceous matter; of the embryo, *i. e.* the young plant, conſiſting of a radicle and plumule.

The embryo lies in a dormant ſtate, *i. e.* alive, but not exerting its life, until it be put in proper circumſtances, which are, of heat, moiſture, and expoſure to the air.

It requires different degrees of theſe, to make different ſeeds grow.

Firſt, if a ſeed once begins to grow and is ſtopped, the embryo dies. Secondly, the embryo may alſo die from age, *i. e.* if the ſeeds are kept too long; and in ſome ſeeds, this happens in twelve months, in others not in twelve years. Thirdly, it may be deſtroyed by inſects. Fourthly, it may undergo fermentations from moiſture;

or, Fifthly, it may be killed by poiſons. In all theſe caſes, the vegetation of the ſeeds is deſtroyed.

When a ſeed is put in the proper circumſtances for growing, the farinaceous matter in the cotylidons is converted into ſugar, the embryo ſwells, and the radicle puſhes forward till it gets through the huſk, and afterwards runs perpendicularly downwards, till it breaks out into fibres. Theſe fibres run in different directions, but never penetrate above a certain depth from the air.

When the radicle has got into the earth, the plumule riſes upwards, ſometimes bringing along with it the cotylidons, which are, in ſome inſtances, converted into the ſeed-leaves.

During this time, the plant is nouriſhed principally by the cotylidons: for if the root be deſtroyed, the plumule will riſe up, and when it gets above ground, and its leaves ſpread, freſh roots will be thrown out.

If a plant be cut off below the cotylidons, it will hardly ever puſh out freſh leaves, but rots and is deſtroyed; on the other hand, if it be cut above the cotylidons, it generally ſhoots afreſh, and continues to grow: therefore, if plants whoſe cotylidons come above ground, as turnips, be cut, or eaten to the ground by any animal, they decay; but if ſuch whoſe cotylidons remain below ground, the graſſes for example, are cut, they ſhoot out afreſh.

After the plumule is come above ground in the graſſes, there is a knot or ſwelling formed above the cotylidons, where the ſtem divides into, or throws off, ſeveral branches and freſh roots, and as ſoon as the leaves of theſe ſpread, the firſt root dies. This is called tillering.

Theſe branches are more or leſs numerous according to the richneſs of the ſoil, the tenacity of it, the room the plant has to grow in, the moiſture of the ſoil, and the earlineſs of the ſeaſon.

Each of theſe branches may be made to divide a ſecond time, by ſowing the ſeed early in the autumn: it, in this caſe, branches out in the autumn, and again in the ſpring, by cutting the ſtems, by cutting the roots, by tranſplantation, by great moiſture in the ſoil; and hence corn, after it has flowered, will ſometimes branch out a ſecond time after heavy rains.

If a graſs be made to branch out a ſecond time, in a poor ſoil or dry ſeaſon, the branches are apt to run up weak.

Moſt perennial plants, excepting trees and ſhrubs, become ſo, by branching out afreſh every autumn; the old roots and plants dying.

Roots puſh forward with conſiderable force, which however is not equal in all parts; and a conſiderable reſiſtance ſtops them, and makes them branch out laterally.

If the reſiſtance from the tenacity of the ſoil be too great, they break out into a vaſt number of branches, too weak to ſupport the plants; and if too little, they run out into long fibres, having too few ends or mouths to abſorb ſufficient nouriſhment.

The root always runs to where there is the leaſt reſiſtance. The ſtems go on flouriſhing more or leſs, according to the moiſture of the ſoil, the heat, the ſoil's being adapted to the roots, the richneſs of the ſoil, its cleanneſs from noxious ſubſtances, and the time the ſeed has been kept: for the ſhorter time it has been kept, the more luxuriant the plant.

The ſtem puſhes out from itſelf, the flower-ſtem; which riſes either laterally, as the leaves ſpread, as in peas; or terminates the ſtem: and in this caſe, either there is only one, as in graſſes, or ſeveral, as in turnips and cabbages.

When the flower-ſtem riſes laterally, the leaves continue to flouriſh after the flower is dropped off, and of conſequence till the ſeed is perfected, and the whole plant dies; but when the flower-ſtem is terminal, the leaves begin to wither as ſoon as the flower drops off. Hence, as the nouriſhment after this period, is drawn entirely from the ground, without any exſudation into it of juice imbibed from the air, it follows, that graſſes and other plants which have terminal flowers, enrich the ſoil till they flower; but afterwards impoveriſh it; perhaps, in ſome degree, in propotion to the weight of the ſeed.

In graſſes, no new leaves ſpring out from the ſtem, after the flowering; and thoſe which have already ſprung out begin to loſe their juices and decay.

Graſs ſhould therefore be cut for hay, as ſoon as it is fully in flower. Different graſſes flower ſooner or later; therefore, if two graſſes grow in the ſame field, either one or other muſt be cut too ſoon, or too late.

All plants have male and female parts of generation; the chives, or male part; the pointal, or female part. The chives are bags, containing a powder; they open juſt as the flower opens, and the powder impregnates the female part. This impregnation is ſometimes prevented by cold, by very violent rains, by weakneſs of the whole plant, by weakneſs of the roots; ſo that in moiſt ſoils, or very rainy ſeaſons, when the plant appears to be flouriſhing greatly, and a ſufficient quantity of flowers are thrown out, the impregnation does not take place, and the ſeed or fruit either drops off entirely, or is ſmall and ſhrivelled; the roots being rotted by the moiſture.

Impregnation is alſo prevented by the want of air. When the leaves and ſtem of a plant flouriſh greatly, it ſeldom produces many flowers.

In graſſes, as the nouriſhment is drawn from the roots after they flower; if the roots are rotted by moiſture, the ſeeds will not be perfected: in the ripening of the ſeed, the farinaceous part of the cotylidon is produced.

Plants cannot live without air: it probably anſwers the ſame purpoſes to them, as it does to animals. The action of the air appears to be principally on the ſmooth ſurface of the leaves, or on the bark of the ſtem.

The air is rendered effete by the plant, ſo that there muſt be a continual ſupply of freſh air; otherwiſe the ſtem runs up to a great length, is exceedingly ſmall and weak, the leaves endeavour to ſpread out to a great diſtance, no impregnation takes place in the flowers, the proper juices are not formed, and the whole plant is deſtroyed. Hence, if ſeveral plants are ſown in a ſoil, thoſe which are beſt adapted to it, will grow up ſtrongeſt, rob the others of the air, and deſtroy them.

The roots alſo require air; ſo that if a root be too deep planted, it will not grow, and different roots require alſo different degrees of expoſition.

It is only reſpirable air that will anſwer thoſe purpoſes.

Light is alſo neceſſary for the growth of a plant, but not ſo much as air. Moſt leaves have two ſurfaces, one of which is always expoſed to the light; and if the other is turned to it, (by altering the poſition of a branch) the growth is frequently ſtopped, until the leaves turn themſelves to it again. This ſmooth ſide of the leaf therefore, being that which is acted upon by the air and light, would appear to be that part by which a plant principally lives: and in many plants the leaves ſhut themſelves up, ſo as to cover the ſmooth ſide on expoſure to cold air, noxious vapours, darkneſs, or even upon being touched.

The want of a ſufficient quantity of light, prevents the plant from forming its proper juices, (except mucilage and ſugar) deprives it of its blue colour, (the green conſiſting of blue and yellow) leaving it either yellow or colour-leſs, makes it run up weak, and prevents the impregnation of the ſeeds. The want of ſufficient air and light, particularly affects the impregnation.

Heat, in a moderate degree, according to the diſpoſition of the plant, makes the leaves flouriſh, and the ſtem ſtrong, provided the ſoil be ſufficiently moiſt; in a very great degree, it makes the plant run up too ſoon to ſeed, eſpecially in a dry ſoil, and prevents the growth of the leaves. Heat alſo prevents moiſture from rotting the roots, or any other parts of a plant, but it increaſes the effects of moſt other poiſons.

The advantages of draining a ſoil are, the preventing the water from rotting the ſeeds, or rotting the roots, eſpecially at the time of flowering; or taking off the effects of the mucilage by too great dilution.

The advantages of fallowing are, the converſion of the vegetable fibres into mucilage, by ſtopping their vegetation, and expoſing them to the air. Alſo, by deſtroying weeds, by giving their ſeeds an opportunity of growing, killing them, and converting them into mucilage; likewiſe, by decompoſing pyrites, and other metallic and alluminous ſalts.

A very poor ſoil will be but little benefited by fallowing; inaſmuch, as there is nothing contained in it capable of being converted into mucilage, except the rain water. It is therefore better to employ an enriching crop.

Fallowing for ſeveral years ſucceſſively would deſtroy a ſoil, as it would convert the whole putreſcent ſubſtances into mucilage, and that mucilage into ſalts, and theſe would be decompoſed.

The advantages of drilling are, the giving an opportunity to deſtroy the weeds, cutting the fibres of the roots, ſo as to make them branch out again, loosening the earth about the roots, and throwing freſh earth on the ſtems, ſo as to make freſh roots break out; the ſaving ſuperfluous ſeeds, and ſowing the ground more equally, and giving free paſſage to the air.* From ſuch advantages as theſe, plants flouriſh and grow ſtrong, healthy, and vigorous, and are thereby enabled to reſiſt thoſe blaſts and rains which would infallibly lodge the weak and feeble plants, that vegetate under leſs favorable circumſtances.

I cannot cloſe this ſection, without giving a ſhort account of a curious experiment made by Mr. Arbuthnot, upon the growth of wheat, in order to inveſtigate the nature and ſucceſſion of its roots.

Mr. Arbuthnot had received a hint from Dr. Fordyce, on the different ſucceſſion of the roots of plants, and found the ſame clearly laid down in a manuſcript ſaid to be written by Dr. Cullen, Profeſſor of Chemiſtry, at Edinburgh, who explained the nature of the roots of culmiferous plants, in the following words. "Culmiferous plants have three ſets of fibres: the firſt ſet is formed on the radicle, the ſecond ſet is formed above this, at a knot on the plumule; the third, at a knot on the plumule above the ſecond: this the diſcovery of Bennet, upon the due formation of theſe three knots and ſets of fibres, I judge the tillering of frumentaceous plants does entirely depend: that if theſe knots are imperfectly formed, the plant imperfectly tillers. Theſe three knots are termed by Bennet, the infancy, the adoleſcence, and the maturity of the plant. At the two uppermoſt knots, the tillering is formed."

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* Dr. Fordyce's Elements of Agriculture, p. 72, and ſeq.

Mr. Arbuthnot was hence induced to ſow a few grains in water, to watch the ſucceſſion of the roots. He cut a hole an inch ſquare in a bung-cork, in which he laid ſome wool, and upon that three grains of white wheat, and floated them on water in a glaſs tube eighteen inches long. Firſt, there were three fibres ſhot from the radicle, which branched into innumerable fibres; upon the wheat ſpearing, freſh fibres ſtruck out as deſcribed by Dr. Cullen. Soon after they were eſtabliſhed, the three firſt fibres with their branches gradually decayed; as ſoon as it was in ear, the freſh fibres made their appearance, ſoon after which the ſecond decayed, and the laſt remained in poſſeſſion of the water. The roots ſtraightened, when taken out of the water, meaſured two feet and a half long. The wheat bloſſomed and ripened in its regular courſe.

He tried the ſame experiment in another glaſs, mixed with ſome wood-aſhes: the ſeed rotted on the ſurface; owing, as ſuppoſed to the quantity of wood-aſhes being too great. The motive was to ſee if it would lead to any diſcovery of the cauſe of ſmut; for Mr. Arbuthnot apprehended that diſeaſe to be owing to a want of proper nouriſhment in the laſt ſucceſſion of roots; the grain then being in a mucilagenous ſtate, there may not be a ſufficient quantity of food to carry it through that ſtate. He has obſerved, that part of a field which has been full of weeds, ſmutted when the reſt has eſcaped; and likewiſe, when ſtrong land has been much poached in ſowing, and afterwards baked, whether on the head-land or middle of the fields, ſuch parts have been moſt ſubject to ſmut; owing, as he believes, to the ſurface of the earth not being pervious enough to admit the laſt ſet of fibres, which it is to be obſerved, firſt ſhoot from the plumule into the open air, and then introduce themſelves into the ſurface, frequently at the diſtance of three quarters of an inch. This fact Mr. Arbuthnot has many times remarked, in examining the roots of field-wheat.

This curious inveſtigation of the ſucceſſion of the roots of culmiferous plants, and the formation and growth of the laſt ſet of fibres, leads naturally to two concluſions of great importance: Firſt, that it is highly neceſſary to have the ground well prepared by hoeing, for the reception of theſe fibres iſſuing from the laſt knot; otherwiſe, the plants are not only deprived of the nouriſhment required, but alſo of hold and ſtability againſt the attacks of wind and rain, and are thereby eaſily lodged. A moſt intelligent friend of mine, whoſe veracity I can thoroughly rely on, informed me, that he has ſeen a whole field of wheat laid down as if mown, and withering on the ground; and that upon examining into the cauſe, he found the above mentioned fibres had not been able to penetrate the ſurface of the ground, which, from much wet, and a ſudden drought, was to them become hard and impenetrable.

And, ſecondly, ſhould we not alſo from hence conclude, that the feeding of wheat with ſheep, may be attended with very dangerous conſequences? for, if this part of the root, being above ground, is nibbled or wounded by the teeth of theſe animals, it might prevent them from ſending forth a ſet of vigorous fibres, ſo neceſſary to the ſtability, health, and produce of the plant.

However plauſible this ſyſtem may appear, and however much it may ſeem ſupported by experiment; yet there are many intelligent perſons, who do not admit of it, in its full extent. The Rev.

Mr. Cooke, the ingenious inventor of the drill-plough, contends that the third and laſt ſet of roots are by no means a certain offspring of culmiferous plants, but merely an adventitious or caſual growth, produced by the great vigour of the plant, and the fertility and moiſture of the ſoil, when laid up to the ſtem. This, he ſays, may create this laſt ſet of roots, which may lay hold of the earth, and increaſe the ſtability of the plant, but are not abſolutely neceſſary to its nouriſhment.

He very juſtly obſerves, that by Mr. Arbuthnot's experiment, the laſt ſet of roots do not puſh out till the wheat is in ear; and yet by Dr. Cullen's hypotheſis, they are ſuppoſed to be the cauſe of the tillering of the plant. One or other of theſe concluſions muſt be erroneous.

Mr. Dickſon, author of the Faſciculus Cryotogamicarum, and a perſon of much knowledge in the vegetation of plants, is of opinion, that though this laſt ſet of roots does not contribute in any reſpect to the tillering of the plants, yet it muſt be of real utility to the plant, otherwiſe, it would not be there. He ſays, Mr. Arbuthnot muſt be miſtaken, when he ſuppoſes that the firſt ſet of roots dies, when the ſecond eſtabliſhes itſelf in the ground; or that the ſecond dies, when the third eſtabliſhes itſelf in the ground. Theſe roots, ſays he, become indeed hard and wiry, but do not die, till the plant is fully ripe, and begins itſelf to decay. Then indeed the roots alſo decay, but not till then; for they adminiſter nouriſhment to the plants, till the laſt.

Dr. Hunter, in his Georgical Eſſays, (p. 28, of the laſt edition) has given us a ſyſtem, differing in ſome reſpects from all of theſe; which, he tells us, he drew from long and careful obſervation. Without taking any notice whatever of the laſt, or uppermoſt ſet of roots, he mentions the former two; the firſt of which he calls the ſeminal roots, which he makes proceed immediately from the grain and ſeed ſown. From this ſeed, he deſcribes a pipe ſhooting upwards to the ſurface, which is by Dr. Cullen, and others, called the plumula. This pipe he mentions as conveying nouriſhment to a knot or ſwelling, very near, but under the ſurface of the ground, and from which knot he makes the coronal roots to ſpring, and to incline downwards, ſo as to lay faſter hold of the ſoil. According to the length of the pipe, or plumula, he ſuppoſes the plant to be ſtronger or weaker; but why its additional length ſhould give additional vigour to the plant, he forgets to explain.

Here, then, is abundant variety of opinions, upon a fact not fully aſcertained, and which is well worthy of the attention, and accurate experiments, of the curious cultivator.

SECTION V.

Of the Preſervation of Corn.

IN countries where there is much uncertainty of the weather, as in our own, the corn, when reaped, is commonly laid up, either in ſtacks or in barns. The manner of making the former, and the advantages attending them, have been already ſpoken of. Stacks ſhould always be placed on a dry eminence, and be well fenced againſt cattle. When the huſbandman has begun to uſe a ſtack, he ſhould houſe the remainder of it as ſoon as poſſible; for which reaſon, it is moſt eligible to make them ſmall and more numerous, and when rightly managed, they will ſave conſiderable expence in otherwiſe neceſſary buildings.

To make the threſhing floor, the ſurface of the place is dug away to the depth of about ſix inches, and the earth thus taken off, after being cleared of ſtones, is mixed with the ſtrongeſt clay that can be had, and with dung of cows or oxen.

This mixture is then worked together with water, till it is of the conſiſtence of thick mortar, and the compoſt thus made, is ſpread as ſmooth as poſſible, with a trowel, upon the ſpot from which the earth was taken. As it cracks in drying, it muſt be beaten down with great force; or rolled with a heavy roller, till all the crevices are filled up; and this muſt be continued, till it is quite ſolid, hard, and firm.

This is the common method: but there is a more ſimple way that will ſucceed better, which is, by taking good ſtiff clay, free of ſtones, and laying it down in the place where the floor is to be made, in the ſame form, and on the ſame bed in which it formerly lay; then beat it down and roll as above, without adding any new mixture to it, and it will thus beat into a more ſolid and compact body, than by giving it any additional ingredient. Two, or even three layers, of three or four inches thick, may be neceſſary, to make it very cloſe and firm.

The beſt barn, both for threſhing and keeping of corn, is, undoubtedly, that which is drieſt, ſmootheſt, moſt completely ſolid, and, conſequently, freeſt from cracks and holes, in which vermin or inſects might ſhelter themſelves and breed.

The ancients were very careful in this reſpect, and uſed lees of oil in forming their floors, to prevent the growth of weeds, and alſo to preſerve the corn from being devoured by mice and rats. Their barns were always placed high, and as dry as poſſible.

I am however perfectly convinced, that there are no floors ultimately ſo good or ſo cheap, as thoſe formed of ſound, thick, and well ſeaſoned oak-plank, which both anſwer well for threſhing, and for preſerving the grain from all moiſture; and when cloſe jointed, planed, and tongued, will lodge no inſects, and allow no ſeeds to eſcape. Theſe flooring boards ſhould be laid on joiſts raiſed a little from the ground, and the ſpace underneath ſhould have a layer of chalk, well rammed or beaten down, to prevent the damp air from riſing and rotting the joiſts. If no chalk is near, a free circulation of air muſt be admitted. Barns are commonly built of ſuch materials as are moſt readily found in that part of the country where they are erected.

It may however be proper to remark ſome few circumſtances reſpecting their conſtruction: *viz.* that their roofs be well covered, ſo that no wet may penetrate to the inſide, which would hurt the corn. Frequent apertures ſhould be left in the ſide-walls to admit a thorough draft of air, without letting in rain or ſnow. This is not difficult to be contrived; for as there are ſheds for various purpoſes generally leaned to the walls of barns, the apertures may be made under the roofs of theſe ſheds. Two large folding doors ſhould face each other, on the oppoſite ſides, for the convenience of carrying in and out a waggon load of corn in ſheaves; and theſe doors ſhould be of the ſame breadth as the threſhing floor, to afford the more light and air, for threſhing and for winnowing.

It is moſt adviſeable, and indeed moſt commonly practiſed, in countries which abound in corn, to have a ſeparate barn for wheat, another for ſpring corn, ſuch as barley and oats, and a third for peas, tares, clover, ſainſoin, &c.

Some art, which muſt be the reſult of practice, is required in the placing and piling up of the ſheaves, both in ſtacks and in barns. The former has been ſpoken of; and in regard to the latter, the ſheaves ſhould, as much as poſſible, be preſſed ſo cloſe to the walls of the barn, as not to afford the leaſt room for rats or other vermin to get in between them: for if they once get admittance, they will ſoon penetrate farther, lodge themſelves in the mow, and do vaſt prejudice to the corn. Where this misfortune happens, the only remedy is to take down the mow, kill the vermin, and pile it up anew.

This is however a laborious taſk, and therefore I would adviſe the huſbandman to have his barn at leaſt, well cleared of vermin before the corn is lodged there, and it ſhould be lined with very thin iron plates, to prevent them from getting into it.

Grain which is preſerved ſome months in the ſtraw, and is heated in the mow, certainly ſweats out its moiſture, and gets harder and fitter for keeping: but people of ſkill are not agreed, whether grain is moſt proper for ſeed when quite new, or after being kept till the following year.

There ſhould always be a ſpace reſerved in the barn, or in ſome out-houſe adjoining, for laying up the ſtraw of all kinds; as nothing is more uſeful about a farm yard; not only for the food of cattle and horſes in the winter, but alſo for cutting into chaff to mix with horſe-corn, alſo for litter to all the animals, both in the houſe and in the yard; all of which is productive of a large quantity of excellent manure, when trodden down and mixed with the dung and ſtale of cattle. In another building adjoining to the barn, or in a lean-to, ſhould be contrived a floor of thin fire-ſtone, tiles, or plates of caſt-iron; which might be of any convenient ſize, not leſs than ten by fifteen feet. Under this floor ſhould be formed a flue, with partitions of brick-work, of one half brick in thickneſs, and this flue ſhould meander backward and forward under the whole extent of the floor, from a fire place and furnace door at the one end, to a perpendicular flue at the other, riſing to a convenient height above the roof, like a chimney top. A fire lit with any fuel, in the furnace, will draw through all the meanders or windings of the flue, and riſe through the chimney top, into the air, by which means the floor will ſoon be heated; and upon this floor the new threſhed grain ſhould be thrown in conſiderable quantities, and turned with a ſhovel till no moiſture or ſteam ariſes from it, and that it feels perfectly dry, ſmooth, and ſlippery.

This operation, which may be performed at a very ſmall expence, will be particularly uſeful to grain which has been houſed ſomewhat damp; from a rainy ſeaſon, or any other circumſtance: but even in the drieſt years, it will improve the look and the feel of the wheat, ſo much, as to make it more marketable and bring a better price; nor will it injure it for any one purpoſe whatever, but on the contrary, will improve it intrinſically.

It is well known that gardeners put their choiceſt ſeeds, ſuch as thoſe of melons, &c. on the tops of their hot-houſe flues, in order to dry and preſerve them for ſowing. This floor, heated ſufficiently, might alſo anſwer the purpoſe of preſerving wheat from that deſtructive inſect, the weevil, inſtead of the oven recommended by M.

du Hamel, and could be uſed with much leſs trouble and expence. Such a floor might anſwer alſo for malting, and for preparing potatoes, and other roots, for the food of cattle, of which I have formerly ſpoken. Nay, perhaps it might even anſwer for drying of hops, hemp, and flax, as I ſhall notice hereafter.

Though the flail be the beſt inſtrument yet known for threſhing of corn, becauſe it ſeparates the grain from the ſtraw and huſks very expeditiouſly; yet, as it always bruiſes a great many ſeeds, even ſo as to render them incapable of vegetating, it were much to be wiſhed that ſome method could be found, by which this eſſential inconvenience might be avoided.

An engine for this purpoſe has been invented by Mr. Winlaw, who has given an account of it in the third volume of the Bath Society's Tranſactions, together with an explanatory plate.

As a ſucceſsful invention of this kind is, in my opinion, a very important deſideratum in huſbandry, it is to be regretted, that we have not yet had ſome ſatisfactory experiments made upon this machine; not with a handful, or even buſhels, but to a conſiderable extent. If ſuch experiments had been made, and favorable reports given, I ſhould with great pleaſure have repeated them here; from a deſire of promoting ſo uſeful a diſcovery.

I have alſo been informed of a water-mill erected at Aloa, in Scotland, for threſhing of barley, and have been told that it ſucceeded; but my information is not ſufficiently authentic, or accurate, to warrant any favorable report of it here.

While flails are our only reſource, it is the more neceſſary to obſerve, that the threſher ought not to wear thick iron-clouted ſhoes, whilſt he is at work, eſpecially in threſhing new corn, and more particularly in threſhing wheat; becauſe they will be apt to bruiſe it. His ſhoes, for this purpoſe, ſhould be ſoaled with an old hat, or ſome other ſoft ſubſtance.

Mr. Mortimer eſteems it a day's labour for a man to threſh four buſhels of wheat or rye, ſix buſhels of barley, five buſhels of oats, or five buſhels of beans or peaſe, if the corn threſh well.

But Mr. Liſle ſays, a good threſher aſſured him, that twelve buſhels of oats or barley are reckoned a good day's threſhing; and that this very man had threſhed fourteen buſhels of oats daily, and winnowed them, for ſeveral days together; but that thoſe oats yielded remarkably well: that five or ſix buſhels of wheat are a very good day's threſhing, and if the corn be clung and yields ill, ſometimes three buſhels are as much as can be threſhed in a day. He rates the common price of threſhing at eighteen pence for a quarter of corn, and obſerves, that ſix buſhels of wheat, of the growth of a warm gravelly vale, are as eaſily threſhed in a day, as four buſhels of the produce of cold hilly land; becauſe the ſtroke of the flail muſt be forced down ſtronger to beat out the grain of this laſt, than it need to be for the former; this may account for the difference between his eſtimate and Mr. Mortimer's.

As the ſtraw of corn which is the growth of a light ſoil, is ſhorter than that of a ſtrong clayey ground, more ſheaves, and conſequently more ears, of this firſt ſort, may be laid together on a floor of equal extent, than can be of the laſt, whoſe longer ſtraw requires proportionably more room.

The prices of threſhing and cleaning a load of wheat of five buſhels,* is here twenty pence, the ſame for threſhing and cleaning a quarter of barley; and for threſhing and cleaning a quarter of oats, ſixteen pence; but if ſmall beer is allowed, two-pence on each of the above articles are then deducted.

But when this work is done by the great, it is often performed in ſo ſlovenly a manner, and ſo much grain is left in the ear, that the farmer muſt either be very attentive, or ſuffer much loſs. This circumſtance alone, would make the invention of a good threſhing machine not only valuable to the individual, but to the public at large.

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* A buſhel of St. Alban's meaſure, is four pecks and three pints, Wincheſter.

The worſe wheat is, though it be never ſo dry, the rougher it will feel when handled; becauſe thin and coarſe wheat is not ſo plump and globular as fine wheat, but is apt to be pitted and wrinkled, which of courſe renders it leſs ſlippery It will handle cooler out of a ſtack two years old, than it will out of one that is only a year old: for in that time the miſts and rimes, eſpecially in a hilly country, will be driven into the ſtack.

Mr. Liſle, who makes this remark, adds, from his own experience, that wheat threſhed in damp weather, generally yields little flour, with much bran, when it is ground; and that if put into ſacks, it will grow muſty in leſs than three weeks, let the weather be ever ſo dry afterwards: but if it be threſhed when the air is perfectly clear and dry, it will keep well in ſacks for a long time; eſpecially if theſe are laid on a very dry floor.

For the keeping of meal, in general, there is no better way, than firſt to bolt it, and clear it from the bran, which is very apt to corrode and putrify it, and make it muſty; then to tread it down as hard as poſſible, and head it up cloſely, in clean, dry, tight, and well bound caſks; which muſt be laid in a cool, dry place.

The beards of barley come off beſt in threſhing, when the ſwarths of this corn have taken the dew before their being houſed. It will keep well in the mow, unthreſhed, for one year; and for making it into malt, which muſt be done before the heat of the ſummer comes on, it muſt not be kept above a year and half, or at moſt two years, otherwiſe it will be filled with weevils, unleſs it has been previouſly cured in a ſtove or kiln, ſuch as I have before deſcribed.

Oats, being defended with a double huſk, are the grain leaſt ſubject to harbour vermin. The beſt way to keep them after being threſhed is, to dry them well on a kiln, and then to barrel them up in clean cloſe caſks: but they ſhould not be threſhed earlier than Chriſtmas, becauſe they are not fit for keeping before that time.

Beans and peas always threſh beſt after they have ſweated in the mow, which they are very apt to do; becauſe, as the whole crop of either of them never ripens all together, the green parts heat, and communicate their ferment to the whole heap. The danger to be guarded againſt here is, that the green ſo heated, do not give fire to the ripe, by which both might be either rotted or conſumed; to which, the bigneſs of their leaves, and hardneſs of their ſtalks, which continue moiſt and ſappy a long time, will alſo contribute very much. For this reaſon, farmers generally chooſe to ſtack them without doors, rather than to houſe them, that they may be more thoroughly dried by the ſun and air. As beans are a very large ſeed, and conſequently full of moiſture, it is found beſt to let thoſe that are intended for keeping, ſweat in the mow till March, when they may be threſhed without danger; for beans never give again, after they have been once thoroughly dried. But if they ſhould be found ſoft and damp even at that ſeaſon, the beſt way is to kiln-dry them; after which they will keep many years without turning or any other care, though they be laid ever ſo thick in the granary.

Peas are of all grain the moſt ſubject to rottenneſs and imperfection, becauſe they are the moſt apt to breed worms, weevils, and mites, by reaſon of the luſciouſneſs and ſweetneſs of their grain. The better they are dried, either in the kiln or ſun, the former of which will generally be found moſt effectual in this country, the longer they will keep ſound, and the fitter they will be for the food of cattle, by making them drink; and if cattle drink, they feed and fatten well. What is intended for the uſe of man, need not be dried too much, but may be preſerved by putting them into cloſe caſks, and heading them up. In granaries, they keep beſt in thick heaps, or in bins; ſpreading them thin upon the floor being apt to dry them too ſoon, and to take from them much of their ſweetneſs and goodneſs.

Vetches wanted for ſeed, immediately after they are cut, may be threſhed upon a cloth, if too ſoft to be threſhed on a floor, where the flail and threſher's feet would be apt to bruiſe and break them.

When a careful huſbandman opens and ſpreads his ſheaves, he will pick out of them at leaſt all the largeſt and moſt apparent weeds, before he begins to threſh. As he proceeds in his work, he will, from time to time, remove with a fork, all the long ſtraw from the corn beaten out of it; which laſt lies always underneath; and then remove the pieces of ſtraw, broken ears, &c. with a wooden rake. He will then ſhovel the remaining grain up on one ſide of the floor, and repeat this till he has threſhed out enough, to make what is commonly called a clearing.

This heap is then paſſed through a wide ſieve, which retains only the bits of ſtraw, and ſuch fragments and ends of the ears as have eſcaped the flail. Theſe frequently contain very good corn; though the farmer ſeldom grudges giving them to his poultry, or binding them up with ſtraw intended for fodder. A few of them incloſed in a ſmall truſs bound at both ends, the better to keep them in, will entice horſes to eat heartily of this ſtraw, which affords them good nouriſhment. They might alſo be good winter's food for ſheep.

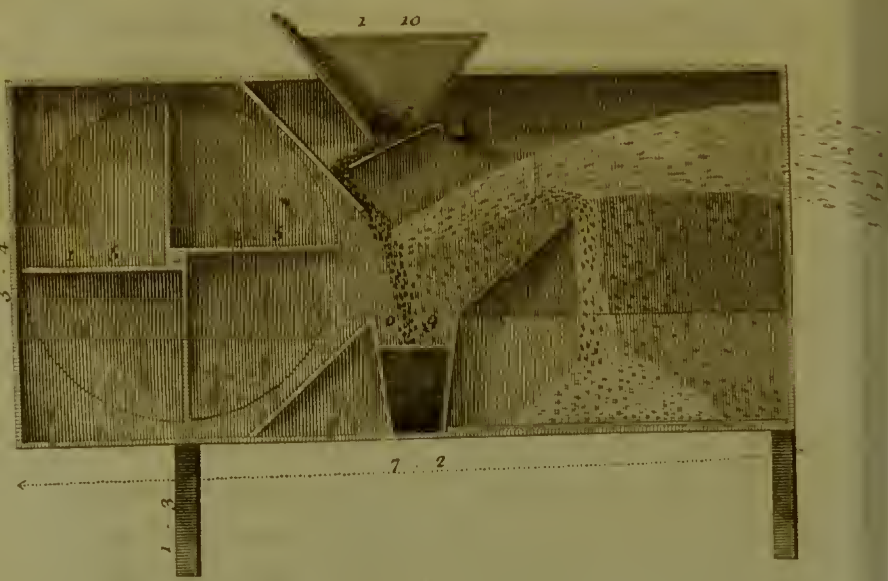
A great deal of labour may be ſaved in the uſing of a ſieve, by faſtening a loop to its rim, and reſting it thereby on a hook ſuſpended by a rope. This will ſuſtain the weight, and the winnower may eaſily give it the circular motion. But a yet more convenient method is, to place a ſquare ſieve of wire, with thin boards for its ſides, upon two poliſhed rods of iron, to throw the corn up into it with a ſhovel, and to puſh it backward and forward on theſe rods, on which it will move glibly, and ſift much corn in a ſhort time.

For ſeparating the chaff, which is the next buſineſs, the caſting-ſhovel is thought to be much more expeditious, than either the wicker-fan, or the common winnow with ſails. When this ſhovel is uſed, the wind ſhould blow through the barn. The winnower then placing himſelf under the wind, and cloſe to the heap of corn that is to be cleanſed, takes it up, one ſhovel-full after another, and, with a circular motion, throws it ſcattered in the air, againſt the wind, towards the oppoſite ſide of the barn. The beſt grains, which are the heavieſt, go fartheſt; the leſſer fall ſhort of them; and the very ſmall, ſhrivelled, and much damaged, with the ſeeds of cockle, darnel, and ſeveral other weeds, fall ſtill nearer to the man who throws them; while the lighter ſeeds of other weeds, with the bits of ſtraw, chaff, duſt, &c. are blown from all the reſt by the wind. From time to time, the winnower quits his ſhovel, and ſweeps away the ſecond ſized corn, which would be too much intermixed with the ſmalleſt, if the heap was left alone and ſuffered to accumulate till the end of the winnowing; and when the whole is done, he ſhovels up the fineſt grain. The ſmalleſt of all, which borders on the chaff, &c. is alſo then collected, and the three ſorts, after being ſifted, or ſcreened, to cleanſe them from any remaining duſt, are laid up ſeparately; the firſt for ſale, the next for domeſtic uſes, and the third, if the farmer can afford it, chiefly for the food of poultry. The ſhort ſtraws and chaff are ſifted in a pretty fine ſieve, to clear them likewiſe of duſt; and are frequently given to ſheep, cows, or oxen.

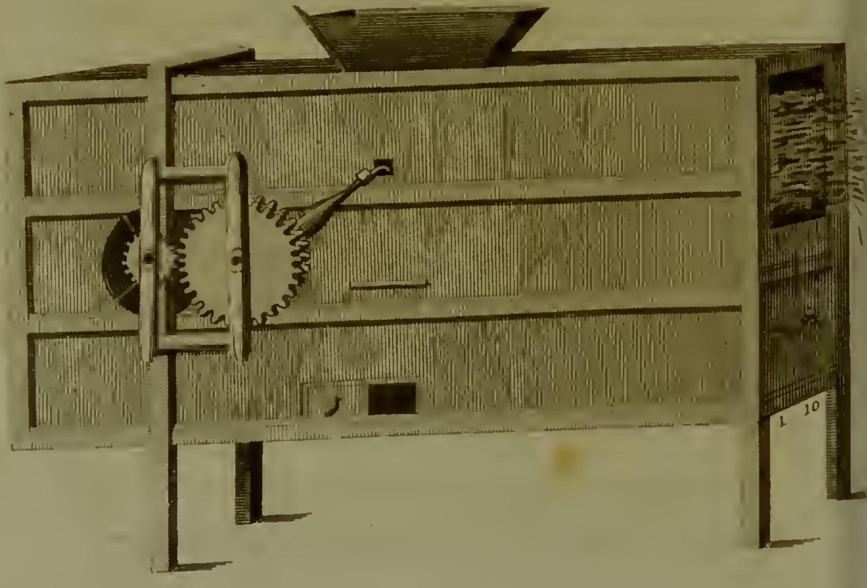
Mr. Liſle obſerves, that the ſeeds of weeds cannot be ſeparated from any grain by the common fan, but that it may be done with the ſcreen; of

Plat

Section of a Winnowing Machine.



Profile View of the same.



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of which he therefore adviſes the conſtant uſe for all ſorts of corn deſigned for ſowing.

Though wind is, in all caſes, the chief agent in the cleanſing of ſeeds, which being intrinſically heavier according to their goodneſs, are carried to different diſtances in proportion to their weight, and thereby ſeparated as I have thus deſcribed; yet the natural action of this aſſiſtant is liable to many inconveniences: it blows not conſtantly, but frequently diſappoints the farmer in his time of greateſt need; and when it does blow, it is not always in the beſt direction to anſwer the ſituation of his barn. Beſides, even when its force can be applied in the beſt way, it is not always then equal; but generally acts by ſudden blaſts, which diſorders the work, and occaſions a waſte of ſeed.

Theſe inconveniencies are now frequently avoided, by uſing a winnowing machine which creates an artificial wind, uniform and ſteady in its action, and always ready at command.

As theſe machines are little uſed in this part of the country, I had one of a very ſimple conſtruction, and moderate price, ſent me from Scotland; and here give a plate and deſcription of it.

Though, happily for this kingdom, we are not, like ſome other countries, under the neceſſity of erecting large edifices for public granaries, becauſe our harveſts are much leſs apt to fail us; yet as on ſome occaſions granaries may be uſeful both to the individual and to the public, I will briefly mention thoſe qualities which render them moſt commodious and moſt perfect.

There are three general rules to prevent the corruption of corn.

Firſt, to take care that it be thoroughly dry, and as clean as poſſible.

Secondly, to make few openings, and thoſe towards the north.

Thirdly, to prevent, by means of thin canvas ſteeped in oil, the too free acceſs of external air, which brings along with it inſects, or the eggs of inſects, which prey upon and deſtroy the grain.

Granaries ſhould be ſtrongly built, and ſtrongly floored, for they carry great weight. Scantlings of oak or fir ſhould be inſerted into the walls, to which a ſtrong deal or thin iron plate lining ſhould be fixed, cloſe to the walls, to prevent vermin lodging there, and alſo to prevent the grain from imbibing any damp from the exterior walls. Good ſtrong deal or oak flooring boards are alſo freeſt of moiſture; they ſhould be plowed and tongued, to prevent the corn from falling through the joints when they ſhrink, which they will do leſs or more, though well ſeaſoned.

There may be ſeveral low ſtories over one another; for the ſhallower corn lies, the better it will keep, and the more eaſily it is turned. Some have a ſmall hole in the floor of the upper ſtory, through which the corn deſcends into the lower one, like the ſand of an hour glaſs; and after it is all come down into the loweſt granary, it is hoiſted again into the upper one; ſo that it is kept in continual motion, which is a great means of preſerving corn. But the uſual way of preſerving it in our common granaries is, after it has been ſifted and ſcreened, to ſpread it upon the floor, about ſix inches thick, to turn it twice a week, and to repeat the ſcreening once a week, during the firſt two months.

It is then laid a foot thick, for two months more; and in this time it is turned once a week, and now and then it is ſcreened again. At the end of ſome months, it is raiſed to the thickneſs of two feet, turned once a fortnight, and ſcreened as occaſion requires; and thus the thickneſs may be gradually increaſed, and the turning and ſcreening diminiſhed, the longer it is kept: at the ſame time, the more frequently this is done, the better the grain will be preſerved.

Thoſe who are deſirous of being more fully informed ſormed on the ſubject, will find it amply diſcuſſed by M. du Hamel, in his treatiſe on the preſervation of grain.

In that treatiſe, M. du Hamel gives an account of his ſucceſſive experiments in preſerving grain from its two great foes, the falſe-moth or corn-worm, and the weevil, by the means of kiln-drying and ventilating.

I ſhall here add a ſhort account, extracted from the Bath Society's Tranſactions, of a very ſimple method of getting rid of the laſt-mentioned inſect; which, if effectual, has the advantage of being both eaſy and unexpenſive.

M. de Broſſes, firſt preſident of the parliament of Dijon in France, finding that the weevils had got among ſome wheat, at one of his farms, tried almoſt every method to get rid of them, but in vain; for his granaries ſtill continued infeſted with this voracious inſect. At length, being informed of a way to deſtroy them, which had been practiſed with ſucceſs in the province of Poictou, he ſet about it in the following manner.

He got ſome live lobſters, which he threw on the wheat that was infeſted, and in four hours time the weevils came out from all parts, diſperſing themſelves over the walls in ſuch numbers, that in many places they were quite black with them, and were thus eaſily deſtroyed.

The ſmell of lobſters, particularly if left till they ſtink, always proves fatal to theſe inſects; and yet will not in the leaſt affect the corn. This remedy ſhould be uſed as ſoon as the weevils appear, or begin to make their neſts*.

Mr. Wagſtaffe has alſo favoured us with a very eaſy method of extirpating theſe inſects; by which, he ſays, he effectually cleared two of his own barns. This is, by turning a hen or two, with newly hatched chickens, upon the heap, which they will traverſe without feeding, or very ſparingly ſo, and are ſeemingly inſatiable in the purſuit of theſe inſects. When the numbers are reduced within reach, a hen will fly up againſt the walls, and bruſh them down with her wings, while her chickens ſeize them with the greateſt avidity. This being repeated as often as they want food, the whole ſpecies will in a day or two be deſtroyed. Of the phalæna (moth) and the ſmall butterfly they ſeem equally voracious.

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* Bath Soc. Tranſ. Vol. II. p. 116.

ESSAY IX.

Of the Culture of various uſeful Plants.

SECTION I.

Of HOPS.

THE beſt method yet laid down for the culture of Hops, is delivered nearly to the following effect, in a pamphlet drawn up, and publiſhed, by order of the Dublin Society for the advancement of agriculture and manufactures.

A rich, deep, mellow, dry ſoil, more incling to ſand than clay, is, in general, the fitteſt for hops; and in particular a black garden mould is excellent. Stiff clays, ſpewy lands, ſuch as are apt to be overflown by floods, hard gravels, ſtrong grounds, very ſandy ones, and ſuch as are not at leaſt a foot and an half deep, are altogether improper for this plant.

The beſt ſituation for hop-grounds, is ſuch as inclines to the ſouth-eaſt, or lies open to it, ſo that they may have the benefit of the morning ſun, to diſſipate the moiſt ſtagnant air, inimical to all plants: and alſo to carry off the morning dews, which lying too long on the plants, may chill the young ſhoots or leaves; and particularly to prevent the bad effects of a ſweet dew or juice, extracted from the plants, or left on them in ſultry hot weather; which dew, if it remains on the plants, is apt to breed inſects, as is frequently the caſe in the bloſſoms of apples and other fruits, which bloom late.

Hop-grounds ſhould alſo be open for the air to have a free paſſage and circulation between the plants; and it ſhould be ſo ſheltered to the north-eaſt, north, north-weſt, and weſt, that neither the froſty winds in the ſpring may cut off the young ſprouts, nor the more ſtormy ones in ſummer and autumn deſtroy the full-grown hops.

The ground and ſituation being choſen, the next buſineſs is to prepare it for the planting. Sufficient directions have been already given for bringing land into the moſt perfect tilth, by deep plowings, croſs plowings, and harrowings; and when thus prepared, it may be ſown with turnip-ſeeds in the end of July, or beginning of Auguſt; and if the turnips are twice hoed, the weeds will be deſtroyed, and the ground rendered looſer and finer. Another good plowing after the turnips are taken off, will, with the enſuing winter mellowing, render it fit for being planted with hops in the ſpring.

If the mould of the hop-ground be naturally good, and brought into fine tilth, there will be little or no occaſion to manure it the firſt year: but if the ſoil is not rich or fine enough, it would be right to give it ſome freſh mould in the ſpring; if mixed with old rotten dung, or marle, or lime, or ſoaper's aſhes, it will be the better.

At fifteen or twenty feet diſtance from the hedge, and parallel to it, ſet out your hills at the diſtance you propoſe, and drive in a ſtake to mark the center of each hill, which may be either in ſquares chequer-wiſe, or in the quincunx form; but the former is beſt, for the reaſons I ſhall mention preſently.

The diſtance of the hills ſhould generally be regulated by the goodneſs of the ſoil, but they ſhould always be ſufficiently diſtant to admit the horſe-hoe without danger to the plants: and by ſetting the plants in ſquares, there is an opportunity to croſs plough in the manner before deſcribed in the culture of Indian corn, potatoes, &c. This is particularly adapted to the culture of the hops, where the diſtance between the plants afford ample ſpace, and the croſs plowing forms and augments the hills.

If the ſoil be dry and ſhallow, ſix or ſeven feet will be a convenient diſtance: but if it be rich, moiſt, and apt to bear large hops and leaves, it may be right to allow eight or nine feet between the hills. If the hills ſhould be found to be too far aſunder, after the ground has been planted ſome time, and is thereby become what is commonly called an old hop-ground, that inconvenience may be ſomewhat remedied, by enlarging the hills, and increaſing the number of roots and poles: and if the hills are too near, it will be neceſſary to leſſen the number both of plants and poles: for the over-poling of a hop-ground, either in number or height of poles, is of much worſe conſequence, than poling it too little.

The moſt proper ſeaſon for planting hops, is from the beginning of March to the middle of April, at the time when they begin to ſhoot.

There are ſeveral ſorts, though the botaniſts allow but of one ſpecies of hops. The moſt eſteemed are the long white, the oval, and the long ſquare garlic hop. Theſe differ from each other in the colour and ſhape of their bells, or hops, in their degree of bearing, and in their time of ripening. The long white is moſt valued, becauſe it is a great bearer, and produces the moſt beautiful hops: for the beauty of hops conſiſts in their being of a pale bright green colour. The oval hop is beautiful, but does not bring ſo large a crop. There is a ſort of white hop, called the early or rath-hop, which ripens a week or ten days before the common, and is therefore of advantage to thoſe who would be firſt at market: but it is more tender, and does not bear ſo plentifully. The long ſquare garlic hop is the greateſt bearer, more hardy, and ſomewhat later ripe than the former; but, by reaſon of its redneſs towards the ſtalk, it is not ſo beautiful to the eye, and therefore is not ſo much eſteemed as the other ſorts.

Few hop-grounds are without ſome plants of a ſort of hop, which many, very improperly, call the female hop. Towards the middle of July, it puts out a great number of long looſe branches of ſmall flowers, not at all like the true hop. The common practice is, to mark them at their firſt appearance, and to root them out afterwards, becauſe they do not bear bells or hops; and as they are generally the ſtrongeſt plants, ſets might otherwiſe be taken from them, by miſtake.

There is alſo a poor ſtarved hop, called a wild hop, which is not judged to be a different ſort, but a hop which has degenerated for want of culture.

The ſeveral kinds, and goodneſs of hops, may alſo be known by the colour of the vines, binds, or ſtalks. The whitiſh binds produce the white hops, both the long and the oval; the grey or greeniſh binds commonly yield the large ſquare hops; and the red binds bear the brown hop, which is the leaſt eſteemed.

The hop-planter ought to be extremely careful in the choice of his plants, or ſets, particularly in regard to the kind of hop: for it is a great trouble and loſs to him when his garden proves to be a mixture of ſeveral ſorts, ripening at different times. He who plants the three ſorts before mentioned, in three different parts of his ground, will have the trouble of picking them ſucceſſively, as they become ripe.

Hop-ſets are cuttings from the roots or branches which grow from the main root or ſtock. They ſhould be procured, if poſſible, from grounds planted with none but the ſort which is deſired; and they ſhould be from five to ſeven or eight inches long, with three or more joints or buds on them: all the old bind, and hollow part of the ſet being cut off.

If it be deſired to increaſe any particular ſort of hop, by taking plants or ſets from it, the ſuperfluous binds may be laid down when the hops are tied, cutting off their tops, and burying the lower end in the hill: or when the hops are dreſſed, all the cuttings may be ſaved, and laid in rows in a bed of good earth: for almoſt every part of them will grow, and become a good ſet the next ſpring.

Some have tried to raiſe hops by ſowing the hop-ſeed; but this turns to no account.

The largeſt ſets ſhould be preferred: the beſt are to be had out of gardens which have been well kept: they ſhould be of the growth of the preceding year; which is eaſily known by their colour, always white when they are of that age.

The ground being prepared as before directed, towards the latter end of February or beginning of March, if the ſoil be light, or late in March if it be ſtrong and moiſt, make in the places marked with the ſtakes, holes about twelve or ſixteen inches wide, and of a depth proportioned to the nature of the ſoil. In general, ten or twelve inches will be ſufficient. If the ground be ſhallow, and you meet with hard clay or gravel, by no means enter into this, for you would then make a baſon to retain water: but in ſuch caſe, raiſe up a ſmall hill of good mould. If there be a good depth of rich mellow mould, dig the hole a foot and a half or two feet deep, and you will find the hops thrive the better, for their tap-roots naturally run downward.

If ſets can be had from a hop-ground at a ſmall diſtance, bring no more of them at a time than you have holes made ready for them, and plant them as ſoon as poſſible; taking care, by keeping the roots in wet litter, to prevent their growing dry: but if the ſets are procured from a great diſtance, lay them up in dry ſand or earth, as ſoon as they are cut, or pack them in ſuch manner that no air may get to them before they are planted; and when you have brought them home, bury them in ground, and plant them as ſoon as the weather will permit.

When all is ready for planting, fill up the holes with the mould thrown out of them, if it be naturally good, after having firſt broke it fine with a ſpade: but if the ſame earth be not rich enough, make uſe of fine freſh mould, or of the compoſt provided for this purpoſe. About a peck or two will be ſufficient for each hill, as was obſerved before; but no new dung ſhould be put into the hole, on any account.

Then, with a dibble, make five or ſix holes the depth of your ſets, one in the middle perpendicular, and the reſt round about, ſloping, and meeting at the top, near the center: put your ſets therein, ſo that they may ſtand even with the ſurface of the ground; and then preſs the mould cloſe to them, and cover them with fine mould two or three inches thick. A ſtick ſhould be placed on each ſide of the hill, to ſecure it. Some place all the ſets in the middle of the hole, before they fill it, ſpreading the lower parts of them towards the ſides, and laying the tops even with the ſurface; then, holding them tight with one hand, they throw the mould in with the other, and preſs it round about them. Either of theſe ways may do; but the firſt is moſt convenient, and moſt in uſe.

Care muſt be taken to plant uppermoſt the end of the ſet which grew ſo before, and not to leave any part of the dead ſtalk on the upper joint. The right end of the ſet may be diſcerned at once, by noticing the direction of its buds or eyes.

If the ſets have begun to ſhoot before they are planted, the young buds ſhould by no means be covered with mould; for that would deſtroy them.

The ground being thus planted, all that is to be done in the following ſummer is, to keep the hills and alleys clear from weeds, by frequent hoeings; to dig the ground in the month of May, and carry off all the ſtones that are turned up by digging; to raiſe a ſmall hill about the plants, to throw ſome fine mould on their roots, and in the latter end of May, or beginning of June, to twiſt all the vines and branches together into a bunch, or looſe knot, and lay them thus twiſted on the top of the hill. Some chooſe to put to each hill one or two ſticks, three or four feet long, for the vines to twiſt about; as more agreeable to the hop, eſpecially if the vines be vigorous: but care muſt be taken to prevent the hop from bearing the firſt year: for that would weaken the plant.

At or about the next Michaelmas, if the weather be dry, and the ground hard enough to bear the wheels of a dung cart, otherwiſe wait till the froſt has hardened it, lay on the alleys between the hills, of rotten dung, or dung mixed with mould, or other manure, which every hop-planter is ſuppoſed to provide for his winter-dreſſing, about forty loads, of thirty buſhels each, to an acre; more or leſs, according to the goodneſs of the land; and in November or December following, dig or plow it in, that it may the better incorporate with the ſoil. Some, eſpecially when they cannot manure their hop-grounds till the ſpring, though it is much better to do it in autumn, give their young hops a ſmall dreſſing in October next after they are planted; and in ſo doing, they open the hill carefully, in dry weather, and cut the binds a little below the ſurface of the earth, then cover the tops of the plants with fine mould two or three inches thick, and lay thereon a thin coat of earth from the alleys.

This defends them from the froſts in winter, and is of uſe at the next dreſſing in the ſpring: but in the mean while, the hop-ground ſhould always be dug or plowed ſome time in the winter: nor ſhould this dreſſing in October be practiſed in any but the firſt year after planting.

Towards the latter end of February or beginning of March, in the ſecond year, when the weather is kindly, open the hills, and with a ſharp knife, cut off the ſhoots of the firſt year, to within an inch of the old ſtock, together with all the young ſuckers that have ſprung from the ſets, and cover the ſtock with fine earth. To keep the knife ſharp, have a whetſtone always at hand, when dreſſing.

In the third and following years, when the hop-ground is dug in February, let the earth be taken away with a ſpade or hoe around the hill, and very near, that the ſtock may more conveniently be come at, to cut it. Then, in fair weather, towards the beginning of March, if the hops be weak, begin to dreſs them; but, if ſtrong and healthy, the middle or latter end of March is the beſt time; for late dreſſing reſtrains their too early ſpringing, which is the cauſe of many injuries to the hop.

The manner of performing the dreſſing is thus. Having, with an iron picker, cleared away all the earth out of the hills, ſo as to lay the ſtock bare to the principal roots, with a ſharp knife cut away all the ſhoots which grew up with binds laſt year, and alſo all the young ſuckers, ſo that none be left to run in the alleys, and weaken the hill: cut them as cloſe as poſſible to the old root, if the plant be ſtrong: to a weak hop, ſome part of the new ſhoot may be left at dreſſing. The tap roots, that run downward, ſhould not be cut by any means, but only the ſide roots, which would otherwiſe incumber the ground. Great care muſt be taken not to hurt the old roots; but all the new ones ſhould be cut away, and ſuch as are intended for new ſets, ſhould be laid by for planting out. The old roots are red, and the young white; ſo that they are eaſily diſtinguiſhed. If there happens to be wild hops in any of the hills, they muſt be taken up and deſtroyed. Some are of opinion that, in this caſe, the whole hill ſhould be grubbed up, and the ſpot new planted.

When the hop has been long planted, it is adviſed to cut one part of the ſtock lower than the other, and the following year to cut that part low, which was before left the higheſt. This will make the plants ſhoot with the greater vigour.

When the roots are thus pruned, apply ſome rich mould or manure, to them; but without making the hills too high at firſt, leſt it hinder the growth of the young ſhoots.

Though the hops are ſpringing out of the hill before they are begun to be dreſſed, there is no danger from cutting off their roots.

No poultry, and particularly geeſe, ſhould be ſuffered to run in a hop-garden in the ſpring, becauſe they are apt to devour the young ſprouts.

If the hops are grown old, or worn out of heart, as it is termed, they will be recovered, and at the ſame time the weeds will be deſtroyed, by digging or plowing round them in the beginning of winter, or at fartheſt in January or February, and laying rich freſh mould to their roots, in lieu of the former exhauſted earth, which ſhould then be taken away, as deep as can be done with ſafety to the plants.

After the hops are dreſſed the ſecond year, the next buſineſs is to pole them. Poles of only ten or twelve feet high will then do: but in the third year, by which time they come to their full bearing ſtate, they will require poles of full ſize. This, if the ground be rich, and the hop vigorous, will be from ſixteen to twenty feet, or even more; or there would be danger of loſing great part of the crop.

If the hop be weak and the ground not rich, the poles ſhould not be more than from fourteen to eighteen feet long, for fear of impoveriſhing the root; for the hop will ſoon run itſelf out of heart, if over-poled; ſo that, as was before obſerved, there is more danger in over-poling, than in under-poling: neither can a good crop be expected from an over-poled ground, becauſe the branches which bear the hops, grow very little, till the buds have over-reached the poles, which they cannot do when the pole is too long. Two ſmall poles are ſufficient for a hill in a young ground.

Three poles to a hill is the number generally uſed. If the hills are large, and diſtant from one another, ſome put four poles to them; but if they are ſmall and near, two poles may do. In dry hungry ground, the poles may ſtand nearer together, than in a rich mellow ſoil; becauſe, this laſt will produce the largeſt, and moſt haulmy plants.

Before the poling is begun, the poles ſhould be diſperſed over the ground, three to a hill; obſerving to put the largeſt poles to thoſe hills where the hops appear to be moſt vigorous; but do not begin to pole till the young ſhoots are ten or twelve inches above ground, which will be about the middle of April, or fourteen days after dreſſing, in rich land. It will then be diſcernible, where the biggeſt poles are required;

and you may continue poling till the hops are two feet or more in height: but it muſt not be too long delayed, leſt the hops be prejudiced, by not having a pole or ſomewhat elſe to climb upon; and if the binds are ſuffered to grow ſo long as to fall into the alleys, they will be apt to entangle with one another, and not ſo readily take the pole afterwards.

The better to fix the poles in the hills, make holes in the ground with a ſquare iron crow, ending in a ſharp point; or with a long wooden dibble, ſhod in like manner at the point with iron. This inſtrument ſhould be about three feet long, and not altogether ſo thick as the poles, in order that they may take the better hold. Its top ſhould be like that of a ſpade, furniſhed either with an eye-handle, or a crutch. that the workmen may the better force it into the ground.

The depth at which the poles ſhould be fixed in the earth varies, according to the height of the pole, the ſtiffneſs of the ground, and the expoſure of the plantations to the winds. High poles, looſe ſoil, and a great expoſure, require their being put at the greateſt depth; but this general rule ſhould be obſerved every where, that the pole be faſtened ſo deep and ſo well, that it ſhall rather break than riſe. The uſual depth is about a foot and an half.

Make the holes at about a foot from the centre of the hill, or three inches from the main root, taking great care not to hurt the root of the plant, or any of its young ſhoots. Make three holes in each hill, one to the eaſt, another to the north, and a third on the weſt ſide of it, that all the hops may better receive the ſouth ſun. When the holes are made, force the poles into them; driving them down with a quick motion, and place them as perpendicular as poſſible, or rather bending a little outward from the hill, to prevent the entangling of the vines. A leaning pole commonly bears moſt hops; but it is more apt to be blown down, than an upright one.

When the poles are erected, ram the earth down on each ſide of them with a rammer, to ſecure them againſt the wind; but do not uſe the rammer within ſide of the poles, for fear of bruiſing the ſhoots of the hops. The rammer may be made of a piece of wood, about four feet long, and three inches thick at the bottom.

Have always ſome ſpare poles in reſerve, to ſupport the vines, in caſe any of them ſhould break or be overburthened; for if the hops are ſuffered to lie on the ground, they will ſoon periſh.

If, after ſome time of growing, a hop is found to be under-poled, place a taller pole near it, and bring the hop from the one pole to the other.

It is adviſable to place the largeſt and ſtrongeſt poles in the third or fourth outermoſt rows of the plantation, eſpecially on the weſt and ſouth-weſt ſides; for they will ſtand beſt againſt ſtormy winds, and protect the inſide of the hop ground.

In dreſſing and forming the poles, cut about a foot or more of the but end, with three ſides ſloping to a point; for this triangular cutting is beſt to prevent their ſhaking in the ground. Poles of alder, birch, poplar, abele, or ſallow, are eaſieſt and ſooneſt raiſed, and do well in low hop grounds; but they are brittle, apt to break, rot ſoon, and do not, at moſt, laſt above four years.

The bark of alder and birch is thought to help the climbing of the hop; but being apt to crack, it ſoon receives and imbibes the wet, which rots the pole; for which reaſon, ſome who uſe them are at the trouble to ſtrip off the bark.

The poles moſt generally approved, and made uſe of in England, are thoſe of aſh, which are tough and ſtrong, and laſt ſix or ſeven years.

Willow poles are alſo in eſteem; but thoſe of cheſnut are the moſt durable.

When the poles are ſet as above directed, and the vines are grown up two or three feet high, ſuch of them as have not taken the poles of themſelves, ſhould be guided to ſuch poles as are neareſt, and have feweſt hops.

The ſtrongeſt vines ſhould always be allotted to the talleſt poles. Two ſtrong, or three weak binds, are ſufficient for a pole. They ſhould be bound about the pole, at equal diſtances, according to the courſe of the ſun, which they conſtantly follow; and the binding ſhould be of dry ruſhes or woollen yarn, but not ſo cloſe as to hinder their climbing up the pole. In doing this, very great care ſhould be taken not to break the young ſhoots, which are more tender and brittle in the morning than in the heat of the day. Women are generally employed in this buſineſs. When the ſelected ſtrongeſt plants of hops have begun to take to and twine round the poles, all the other weak vines ſhould be cut off cloſe to the hill.

The hops ſhould be tended conſtantly during the months of April and May, to guide them to their poles. If the vines are not able to ſupport and keep themſelves to the poles, give them a ſecond tying, as high as can be reached; and if they forſake the pole after they are grown beyond reach, a forked ſtick, or a ladder and back-ſtay, will be uſeful to tye them up again. If the vines are ſtrong, and much over-grow the pole, ſome adviſe to ſtrike off their heads with a long ſwitch, in order to increaſe their branching below.

About Midſummer, or a little after, hops ceaſe to run up in height, and begin to branch. To ſuch as do not, it will be right to ſtrike off the top with a ſwitch, or to divert it from the pole, that it may branch the better; wherever the top or leading ſhoot of a vine is broken off, it will run no further in length, but will put out branches from the next eye or knot; and there, if carefully managed, will take to the pole, and yield a much better crop than the hop would do if ſuffered to ſpend itſelf by running into length of growth.

Having dreſſed, poled, and tyed the hops, as before directed, give the ground a good ſummer digging or plowing, ſome time in May, eſpecially after rain, or at leaſt turn up its ſurface, pretty deep, with a ſpade, or breaſt-plough, or horſe-hoe; throw ſome of the fine earth on the hills, and enlarge their breadth, cutting away, and burying all ſuch ſuperfluous roots or hops, and weeds, as appear on the hills or alleys. This will prevent the hops from being impoveriſhed by weeds, and will alſo keep the hills moiſt. The hills muſt not by any means be made up and finiſhed all at once, but by degrees, and at diffe-rent times. Two or three hoeings, at leaſt, are requiſite in the courſe of the ſummer, and at each of them a little fine earth ſhould be laid on the hills, eſpecially after rain, the better to nouriſh the roots of the plants, and to keep the hills looſe, open, and moiſt. Though it be a general rule, whenever you weed the hills, or hoe the alleys, to caſt ſome fine mould on the hill; yet this admits of an exception: for when the vines are very vigorous and full of ſap, forbear to give them any more earth; becauſe, exceſs of nouriſhment will make them run too much to ſtalk, and thereby prevent their branching out, and conſequently their bearing ſo many branches of hops. The ſap may be increaſed by enriching the hills, but the redundancy thereof cannot be withdrawn at pleaſure.

The fewer weeds there are on the ground, the more hops there will be on the poles: therefore ſuffer no weeds to feed on the hop-ground.

The common ſize of the hills, when they are fully completed, is ſomewhat more than two feet broad, and about a foot and a half high. In low, moiſt, or rich grounds, the hills ſhould be higher and larger: but in dry, ſhallow, higher grounds,

they

they are made ſmall. The higher hills produce larger roots and binds, and better ſets.

In Auguſt, when the hops begin to be in bell, pare again all the alleys clear from weeds, with a hoe, or ſharp ſhovel, and throw the lighteſt of the earth on the tops of the hills, ſo as to make them as large as a buſhel: but be careful not to throw on any weeds, nor to cut any of the binds with the ſhovel. Then too, eſpecially if the hops are deficient in point of vigour, a good deep ſtirring of the alleys will be of ſingular ſervice to them. At the ſame time, or rather before, women ſhould be employed to ſtrip the leaves from the vines to the height of two or three feet above ground, in order to give the hops more air and ſun, and to help their ripening.

Hops, in the uſual way of managing them, are often ſo greatly checked in their growth by a very dry ſpring, eſpecially at the time when they ſhould branch moſt, and even when in bloſſom, that it becomes neceſſary to water them, either by over-flowing the alleys, by means of a ſtream properly ſituated to be conducted thither, and then paring off their ſurface and laying it upon the hills to keep it moiſt; or even by the more tedious and expenſive method of bringing water in wheel-barrow-caſks, and pouring a pail-ful into a hole made with a ſtick, in the middle of each hill; and if the weather ſtill continues dry in the ſummer, this muſt be repeated two or three different times. Can any thing be more ſtriking, than the vaſt advantage it muſt be of to cultivate hops according to the plan of the horſe-hoeing huſbandry, particularly, if done in my way by croſs plowing in the alleys, by which the earth will be kept conſtantly looſe, and thereby moiſt, even in the drieſt ſeaſons? This highly deſerves the moſt ſerious attention of every hop-planter.

Towards the latter end of July, hops begin to bloſſom, about the beginning of Auguſt they bell, and, in forward years, they are ſometimes ripe at the end of Auguſt, or beginning of September. When they begin to change colour, or are eaſily pulled to pieces, when they emit a fragrant ſmell, and when their ſeeds begin to look brown and grow hard, they may be conſidered as ripe: then pick them with all expedition; for a ſtorm of wind will do them great miſchief at this time; and hops picked green and bright, without bruiſing or diſcolouring, will ſell for a third part more, than thoſe that are otherwiſe.

When the poles are drawn up in order to be picked, the vines around them ſhould be cut aſunder, at the height of about three or four feet from the ground; for the cutting of them lower, eſpecially while the hops are green, would occaſion ſo great a flowing of the ſap, as would weaken and hurt the root.

If the poles ſtick ſo faſt in the ground, as not to be taken up without difficulty, and hazard of breaking them, they ſhould be raiſed by a piece of wood in the nature of a lever, having a forked piece of iron, with teeth on the inſide, faſtened within two feet of the end.

The moſt convenient way of picking them is, into a long ſquare frame of wood, called a bin. This frame is made of two poles, or pieces of wood, each nine or ten feet long, and three or four inches thick, joined together at about a foot and an half from each end, by two other pieces three feet long, and ſupported by four legs three feet and a half high, ſo that there remains in the middle of it a ſpace of ſix feet long, three wide, and three and an half deep. In this ſpace is fixed a coarſe linen cloth, or hop-bag, cut open on one ſide, and hung hollow, either by hitching it on tenter-hooks along the inſide of the frame, or by ſtitching it on the outſide with wooden ſkewers, to receive the hops as they are picked. Three men or women, or four boys or girls, may ſtand at each ſide of the frame, and pick two poles at a time

When ſome poles are raiſed, bring them with the hops and vines on them, and lay them lengthwiſe

wiſe upon the frame; or erect a forked prop at each end of the frame, and reſt the poles thereon when picking. There is no occaſion to ſtrip the vines or haulm from off the poles, before they are picked. The workman who raiſes the poles generally carries them to the frames; and theſe, being light, may be eaſily removed from one part of the hop-ground to another.

The ripeſt hops ſhould be firſt picked: but if the hops appear to be equally ripe, in all parts of the plantation, it is beſt to begin to pick them on the eaſt or north ſide of the ground; the more effectually to guard againſt the ſouth-weſt wind's breaking into the garden.

Having choſen a ſpot of ground which contains eleven hills, place the bin upon the hill which is in the center, and after theſe are picked, remove it into another ſpot of the ſame extent; and ſo proceed till the whole is finiſhed.

The hops ſhould be picked as free as poſſible from leaves and ſtalks: for theſe would be of greater prejudice to the ſale, than any ſeeming advantage which might be expected from their weight. The bin ſhould be emptied two or three times a day into a large cloth of clean linen, in which the hops ſhould be immediately ſtitched up with ſkewers, and carried directly to the oaſt, or kiln, to be dried: for if they remain long in the bin, or cloth, they will ſweat, and be diſcoloured.

If any brown hops are met with in the picking, care ſhould be taken to ſeparate them from the reſt, by putting them into a baſket by themſelves.

If the weather be very hot, or rainy, cut no more hops than may be picked in an hour: but, if it be poſſible, gather them in fair weather only, and when they are dry; for this precaution will ſave ſome expence of coals, and contribute to the better preſervation of their colour when they are dried. No hops ſhould be gathered when the dew is on them; for that would make them become mouldy.

When the poles are taken from the hills, twiſt together the remaining ends of the binds; that they may not get among peoples legs, and hinder their work.

Before the poles are drawn, obſerve whether the hops of one pole be entangled above with thoſe of another, and if they are, cut them aſunder with a ſharp hook fixed at the end of a long pole.

If the garden be large, it may be worth while to raiſe a ſhed in the middle of it, to ſhelter the pickers and the hops from the ſun and rain; and to lay hops in over-night, to be picked early the next morning, before the dew is off the other hops. This ſhed will alſo ſerve for preſerving the poles in winter.

If there be either rain or dew on the hops at the time they muſt be gathered, ſhake the pole, and they will dry the ſooner. If they are over-ripe when gathered, they will ſhed their ſeeds, in which the chief ſtrength of the hop conſiſts; nor will they then look ſo green, but ſomewhat brown, which is a great diminution of their value. It is better therefore to pull the hops a little before they are ripe, than to wait till they are full ripe. Four pounds of undried hops, thorough ripe, will make one pound of dry; and five pounds of hops ſcarcely ripe, though in their full prime, will make no more when they are dried.

There are two principal ſorts of hops; *viz.* the green and the brown. The former yields by much the beſt colour when dried, and the other, is the moſt plentiful bearer.

Brown hops are fit for brown ale; but the hops for fine pale beer muſt be green; for which reaſon theſe laſt are moſt eſteemed.

As faſt as hops are picked, they ſhould be dried on a kiln; otherwiſe they will change colour; but if that cannot be done immediately, and they muſt be kept a little while, ſpread them on a [illegible] floor,

[illegible]

floor, by which means they will receive little damage in a day or two.

They who have five or ſix acres of hops, may employ ten frames at a time in picking.

If any of the rath-ripe, or early hops, which bloſſom, and ripen, a week or ten days ſooner than the other ſorts, happen to be intermixed in the ſame plantation, they ſhould be carefully watched, that they may be gathered in time; for if they hang till they are over-ripe, they will ſhed their ſeeds, turn brown, and thereby not only become bad themſelves, but ſpoil the ſale of the others with which they are mixed. It is therefore adviſeable to mark, at the bloſſoming ſeaſon, the hills in which they are, in order to dig them up and replant theſe ſpots: for the trouble of pulling them up ſeparately, when they are ſcattered here and there in a hop-ground, and of carrying them, ſometimes a conſiderable way, to a convenient place, to be picked, is very great, and cannot be avoided otherwiſe than by either baniſhing them totally, which would not be quite conſiſtent with the huſbandman's profit, as they fetch a good price by coming firſt to market; or, which is the beſt way, by planting them in a garden by themſelves.

Very particular care ſhould be taken, that the hops be thoroughly and equally dried. In this lies the greateſt difficulty and art in the management of them: for if they are over-dried, they will change their colour, look brown, and be judged to be burnt; whereby their value will be greatly diminiſhed: and if they be under-dried, they will loſe their colour and flavour. Experience has ſhewn, that a handful of under-dried hops will ſpoil many pounds of others, by taking away their fine ſmell and colour.

The beſt way of drying them is with a charcoal fire, on a kiln covered with hair-cloth, of the ſame form and faſhion as is uſed for drying of malt. It is found to ſuffice in places where only a few hops are raiſed, and a great deal of malt is made; but where the hop-planters have a much greater quantity of hops than can be dried in due time on their malt-kiln, (for hops, as was ſaid before, ought to be dried as ſoon as poſſible after they are picked) they build, in the following manner, ſeveral ſmall kilns, on purpoſe for drying of hops.

Eight or ten acres of hop-ground require a building of about ſixty feet long, and fifteen feet wide in the clear.

At one end of this building is a boarded room, to receive the green hops which are brought from the hop-ground, and which lie ſpread out there till there be room to put them on the kilns: at the other end of the building is another large boarded room, for receiving the hops from the kiln when they are dried, and for them to lie in heaps to ſweat, till they are fit for bagging. In the intermediate part of the building, three or four kilns, of eight or ten feet ſquare each, are conſtructed thus, cloſe to one another.

We will ſuppoſe the middle building twenty-eight feet long and fifteen feet wide; there will be room for three kilns of eight feet ſquare each in the clear, and for their reſpective walls. Theſe kilns ſhould be in a line along the back wall; and will project from it above nine feet; ſo that there will remain a paſſage five feet wide and twenty-eight feet long, at the front of the kilns.

To form each kiln, build the walls of brick, nine inches thick, and let each of the four ſides be eight feet long in the clear, and ſeven feet high. The principal parts of the kiln are, in the uppermoſt part, the bed or floor whereon the hops are to be laid to dry; and in the under part, the furnace, ſteddle, or lanthorn, for the fire. The bed or floor in a kiln of eight feet ſquare ſhould be about ſix feet from the lower floor, ſo that it will be about a foot below the top of the wall. This foot of wall riſing above the bed, ſerves to keep in the hops upon the [illegible] kiln;

kiln, and for men to walk on round about the kiln, to look to the drying of the hops.

The bed or floor may be made of wooden bars an inch ſquare, laid very even and level into a croſs beam, a quarter of an inch aſunder; or, if the kiln be arched below, the floor may be laid with long bricks, or ſtones, reſting on the tops of the arches, at about two inches diſtance from each other.

In making the lower part of the kiln, place the mouth of the furnace at the bottom, in the middle of the front wall of the kiln, and let it be fourteen inches wide and ſixteen inches high. Joining to the mouth on the inſide build the ſteddle or lanthorn of brick, four inches thick. This lanthorn ſhould be fourteen or ſixteen inches wide, and three feet perpendicular in the ſide walls, and it ſhould reach from the front wall of the kiln to within a foot and an half of the back wall; ſo that there will be room for a man to paſs between it and the back wall, and the length of the lanthorn thus made will be about ſix feet. On its ſide walls, bricks of a foot long are to be raiſed on their ends, leaning to and bearing upon one another, ſo as to form a covering like the roof of a houſe; or the top of the lanthorn may be regularly arched over.

In building the ſide walls of the lanthorn, after having laid the two firſt rows of bricks, leave at the end of every brick in the three or four following rows, an open ſpace or hole, four or five inches wide, chequer-wiſe, both in the ſides and back, and lay the uppermoſt row or two of bricks cloſe together, as in the bottom rows, for the better ſupport of the roof. By theſe means there will be three or four rows of holes, which are deſigned to convey the heat equally to all parts under the hair cloth. The roof ſhould be well plaiſtered on the inſide, to reflect the heat.

In the front part of the kiln, on one ſide of the furnace, and two feet high from the ground, a ſmall door ſhould be made, three feet high and two feet wide, ſo that a man may eaſily get in to ſet every thing to rights about the ſteddle. There ſhould alſo be ſteps to riſe to the upper floor, where the hops are dried; and as there is a paſſage below, five feet wide along the front of the kilns, ſo will there be directly over-head on the upper floor, a like paſſage, which will be uſeful in bringing the green hops from their room, and laying them on the kiln, and for carrying them to the ſtore room after they are dried. For greater conveniency, both theſe rooms ſhould be on the ſame floor as the upper part of the kiln.

A further caution neceſſary to be obſerved, is, that no holes be made within a foot of the fire-place or mouth of the furnace, and that all the parts about the kiln be conſtructed ſo cloſe, that no wind or air can poſſibly get in. The farther end of the ſteddle ſhould be built of bricks up to the top, with holes in it as in the ſides.

The kiln ſhould be ſquare, and may be ten, twelve, or fourteen feet over at the top; but there ſhould be a due proportion between the height and breadth of the kiln, and the ſize of the ſteddle where the fire is kept, *viz.* if the kiln be twelve feet ſquare at top, it ſhould be nine feet high from the fire, and the ſteddle ſhould be ſix feet and a half ſquare; and ſo proportionably in other dimenſions. Theſe kilns are made at ſmall expence.

In drying of hops, firſt lay the hair-cloth very even on the bed or floor of the kiln, and ſpread the green hops thereon, about ſix inches thick; laying them with a rake as ſmooth as poſſible, not thicker in one place than another. Let the kiln be moderately warmed before the hops are laid on; then keep an even and ſteady fire under them, but not too fierce at firſt, for fear of ſcorching them; and let not the fire ſlacken, but rather increaſe it till the hops are nearly dried, leſt the moiſture or ſweat, which the fire has raiſed, fall back and diſcolour the hops.

For theſe reaſons it is, that no cool air ſhould be ſuffered to come into the kiln, while the hops are drying; and that wind which would make the fire burn too violently, ſhould not be permitted to blow on the mouth of the furnace. After the hops have lain thus about ſeven, eight, or nine hours, have left off ſweating, and leap up when beaten with a ſtick, then turn them upſide down with a broad malt-ſhovel, or ſcoop made for that purpoſe; or caſt them up into a heap in the middle, and afterwards ſpread them equally on all ſides.

Let them remain in this ſituation for two or three hours more, till every hop, if poſſible, be thoroughly and equally dried; and then, with a hair-cloth, remove them to the heap where they are to lie till they are bagged.

If they do not dry in one place ſo much as in the reſt, which may be perceived by touching them with a ſtick or wand, and obſerving whether they rattle when ſo touched, as they will do when dry; make them thinner in the places where they rattle leaſt. They muſt not be turned while they ſweat; for that will burn them, and make them loſe their colour. The fire may be diminiſhed a little before they are turned, and refreſhed again afterwards: but, theſe times excepted, the heat ſhould be kept as equal as poſſible.

Hops are fully dried, when their inner ſtalks become brittle, and break ſhort on rubbing; and when their leaves fall off eaſily, and feel very criſp. When they crackle and leap a little, as they will do upon the burſting of their ſeeds, then is the time to take them off the kiln.

If the fuel uſed for this purpoſe be either wood or turf, it ſhould be charred firſt; becauſe ſmoke ſpoils the colour and ſmell of hops.

Charcoal made of old rotten poles is moſt commonly uſed. Cinders of ſea-coal are alſo very good, and give a conſtant uniform heat. The fire ſhould be made at the mouth of the furnace only; for the air will ſufficiently diſperſe the heat from thence to all parts of the kiln: and that it may be conſtantly of the ſame gentle degree, neither too ſtrong nor too weak, it may be of ſervice to make uſe of a thermometer; by marking upon which the degree of heat proper for drying hops, as ſoon as that degree is aſcertained by experiment, the fire may always be regulated with great exactneſs: for by putting the thermometer withinſide the kiln for a ſhort time, it may be obſerved, from the height of the liquor, when the heat is come to a proper pitch; and when too high or too low, increaſe or ſlacken the fire accordingly. Any ſervant may, with the help of this inſtrument, be able to mend and correct

correct the fire with great certainty, and not be liable to commit miſtakes, which often prove exceedingly detrimental to the hops. The drying once begun, loſe no time in the proſecution of that work, but employ people night and day, to attend it with the utmoſt care, till it be finiſhed. A large malt-ſhovel full of charcoal, thrown into the mouth of the furnace of a kiln eight feet ſquare, will laſt an hour.

It has been obſerved, that hops dried in the ſun loſe their richneſs of flavour; as other herbs do likewiſe when ſo dried. If they are laid on a floor to dry, without uſing a fire, they will loſe their ſtrength, be apt to ſweat or ferment upon change of weather, and not be fit for packing. Fire exhales their watery parts, and, by retaining, preſerves their flavour and colour.

It may not, perhaps, be improper to ſuggeſt here, that the kiln which I formerly deſcribed for the drying of wet grain, or for malt, is alſo much more ſimple and better contrived for the drying of hops, than thoſe now in uſe: ſince my kiln may be increaſed to any degree of heat, with common fuel, without any danger of ſmoak; which is not altogether the caſe with thoſe of the preſent conſtruction, even when charcoal or cinders are employed: for from theſe, alſo, there is often a noxious ſteam or vapour.

If kilns of this conſtruction were found to anſwer, it might be neceſſary to raiſe the ſide walls two or three feet, by way of parapet, to retain or prevent the hops from falling over: or they might be made of deal, and about four or five inches from the tyle floor, bars of wood might be laid acroſs, as practiſed in the kilns above deſcribed; and over theſe bars would lie the hair-cloth, on which the hops are to be ſpread.

Hops break all to powder if they are bagged hot from the kiln. To prevent this, they ſhould be laid in a heap, to ſweat and grow tough; and if they are then covered for a while cloſe with blankets, to keep the air from them, they will bag the better. There is no limited time for their ſweating; that varying according to the weather: three or four days are commonly ſufficient; but it is a certain rule, that when the hops feel moiſt and clammy, and can be ſqueezed in the hand, or trodden cloſe, without breaking, they are then fit for bagging. The harder they are trodden, the better they will keep.

The bags moſt proper for this purpoſe are made of coarſe linen cloth. They are commonly about eleven feet long, and near two yards and a half in circumference, and contain about two hundred weight and a half of hops. The ſmall bags, called pockets, contain about half that weight.

The manner of bagging is thus: make a round or a ſquare hole, but a round one is moſt convenient, about twenty-ſix or thirty inches over, in the floor of the chamber where the hops are laid in heaps after they have been ſweated. This hole ſhould be large enough to receive the bag, and for a man to go up and down it with eaſe. Tie, with a piece of packthread, a handful of hops in each lower corner of the bag; to ſerve as handles for the eaſy lifting or removing it, and with packthread faſten the mouth of the bag to a frame, or hoop, ſomewhat larger than the mouth of the hole, that the hoop may reſt on its edges; and let it be ſtrong enough to bear the weight of the hops when the bag is full, and of the man who treads them. The upper part of the bag being then fixed by the hoop, let the reſt of it hang down through the hole; but not ſo near to the lower floor, as to touch the ground: then throw into it a buſhel or two of hops, and let a man go into the bag, and, with ſhoes that have no heels, tread the hops down on every ſide, as hard as he can, till they lie cloſe. Let more hops be then caſt into the bag, and be trodden down, as before; and continue this till the bag is full. When that is done, untie it from the hoop, let it down, and ſew up its mouth as cloſe as you can; obſerving at the ſame time, to tie up ſome hops in the upper corners, as was done before in the lower. The harder the hops are preſſed, and the cloſer and thicker the bag is, the longer and better they will keep.

When they are thus bagged, lay them on a boarded floor, and in a dry place; for dampneſs would injure them greatly. At the ſame time all proper meaſures ſhould be taken, to guard againſt rats and mice, which, though they do not eat hops, are very apt to ſpoil them, by making neſts and lodging in them.

Some, in treading the hops, uſe a fifty pounds weight, faſtened to a rope and placed in the middle of the bag. The man in the bag treads about it with his feet, and lifts it up now and then, to preſs them the cloſer together.

As ſoon as the hops are picked, ſtrip their haulm or vines from off the poles, and, as your laſt work, lay the poles up ſo that they may be preſerved. This is done, either by ſtacking, piling, or houſing.

The ſtacking is performed thus. Set up three poles, like an erect triangle, or rather ſix poles, let into the ground with an iron crow, and placed circularly, but inclining to one another ſo as to meet, and be tied faſt together a yard from the top, with bands made of the haulm of the hops. The poles deſtined for the ſame ſtack, ſhould then be erected ſpeedily againſt this frame; for if they are ſuffered to lie on the ground, eſpecially in wet weather, they will receive more damage in a fortnight, than by their ſtanding out, upright, all the reſt of the year. When they are ſet up, about three hundred to a ſtack, bind them round with a rope of twiſted haulm, to keep them together. By ſuch means, the outer poles only are ſubject to the injuries of the weather, and keep all the inner ones dry, excepting at their tops and bottoms, the former of which are, for the moſt part, expoſed to the air, as the latter are to the moiſture of the earth. It is therefore a good method, to cover the tops of the ſtacks with haulm, and to lay ſtones, bricks, or ſand, at their bottom, to preſerve their but-ends from rotting.

Many chooſe to pile them up length-wiſe in different parts of the hop-ground, laying three or four old poles athwart at bottom to preſerve them from the dampneſs of the earth, and ſetting ſeveral poles erect in the ground on each ſide of the pile, to prevent its ſlipping: the poles are then laid on one another, placing the ſmaller ends inwards; ſo that the pile ſhould conſequently be ſomewhat longer than the poles: and when it is raiſed high enough, they bind it acroſs with ropes of haulm, to keep it upright and ſteady, and then cover it with haulm, to defend it from the rain.

This is a better way than the former. But the beſt way of all to defend the poles is, to build in the hop-ground a ſhed or two, which may ſerve as a ſhelter for picking the hops in ſummer, and for laying up the poles in winter, with leaſt danger of their being hurt or ſtolen.

From October to March, there is nothing to be done in the hop-ground, but to provide and bring manure into it, and to give the alleys their winter's plowing or digging.

The dung brought into the ground muſt be well rotted, and laid on the alleys to mix with the earth, but not on the hills; dung being apt to produce vermin, which are extremely injurious to hops. Cold dung, ſuch as that of cows and hogs, is better for hops, than home dung, unleſs the ſoil be cold and wet, and then hot dung, ſuch as that of ſheep, and even of pigeons, will not be improper.

A ſmall dunging every ſecond year is ſufficient; and a plentiful dunging will ſerve for three years, if the ſoil be tolerably good.

Dung was formerly more in uſe for hop-grounds than it is at preſent; experience having ſhewn, that lime, lime-ſtone, gravel, ſea-ſand, marle, eſpecially the ſhelly marle, aſhes, and many other manures and compoſts, which have been pointed out in my former eſſay, as the moſt proper means of correcting the defects of ſoils, anſwer the end much better, and laſt much longer.

The management of the hop ground during the third and every ſubſequent year, for it will continue to yield good crops upwards of twenty years, if rightly cultivated, is the ſame as above directed; ſo that it will require pretty conſtant care and attendance, eſpecially from the beginning of March to the end of September. This may be laid down as a certain rule, that the greater the pains that are taken, and the greater the expence beſtowed on the due culture and management of the hop, the greater will be the profit.

The charge of an acre of hop-ground, in moſt parts of England where hops are cultivated, is computed thus.

For the huſbandry	£ 3	0	0
For the wear of the poles	4	0	0
For picking and drying	5	0	0
For manure	1	10	0
For rent	1	10	0
For tythe	0	15	0
	£ 15	15	0

Fifteen guineas in all: but in ſome places they pay four or five pounds yearly for the rent of the land.

The hop-planters in England commonly agree with hop-dreſſers, to do for three pounds, to three pounds ten ſhillings an acre, all the huſbandry part; in which is included the ſummer and winter digging of the ground, the pruning and dreſſing of the hops and hills, the poling and tying, ſeveral hoeings, and making up the hills from time to time, the laying of the dung on the ground, and all other work, except the bringing of the dung to the ground, and for picking and drying of the hops, which laſt buſineſſes are performed by others: ſo that a gentleman has little trouble with his hop-ground: he need only be careful that the contractor does every part of his work in the proper ſeaſon; and it is ſo much the intereſt of the contractor to be punctual in this, that, if he neglects hoeing when the weeds appear, he will, by ſuch neglect, greatly multiply his trouble and labour in rooting them out afterwards.

An Engliſh acre requires about three thouſand poles, the price of which varies according to their ſize. In ſeveral places, it is uſual to give as many ſhillings for a hundred poles, as the poles are feet long; ſo that for a hundred poles of twenty feet long, they give twenty ſhillings: but where poles are in great plenty, they give but fifteen ſhillings for thoſe of that length. A ſupply of five hundred poles yearly, will keep a hop-ground in conſtant repair: ſo that poles are about one-third part of the yearly charge, the picking and drying are eſtimated at nearly another third, and the reſt is laid out in the managing of the ground.

The hop-planters in England reckon that they have but a moderate return, when the produce of an acre of hops does not ſell for more than thirty pounds. They frequently have fifty, ſixty, eighty, or a hundred pounds for an acre; nay, ſome have had conſiderably more than even this laſt ſum, at a time when the crops of other hop-grounds have failed in general, and theirs have ſucceeded. But if, on one hand, ſuch extraordinary profits are ſometimes made; ſo, on the other, it ſhould be conſidered, that they are attended with much uncertainty, and that crops frequently fail. Upon the whole, if the total charge of an acre of hops is computed, as above, at fifteen pounds fifteen ſhillings a year, and its produce at an average of years at thirty pounds only, the clear profit from an acre will be fourteen pounds five ſhillings a year, which is nearly cent. per cent. on the out-lay.

Though it be common for ten, twenty, thirty, or even more acres of hop-ground to be in the hands of one man; and though ſome, who ſpare neither care, induſtry, or expence, to make their plantations of this kind flouriſh, receive two thouſand pounds a year for their hops, notwithſtanding the high price of labour, manure, and every other article relating to their proper management, yet, the intelligent huſbandman will eaſily perceive, that it is not prudent for poor farmers, or men of ſmall fortune, to engage far in this branch of improvement: for it requires a pretty conſiderable ſtock at firſt, to cultivate a large plantation, and to perform every other requiſite. The expence will neceſſarily be great, and the farmer who undertakes it muſt expect to lie out of his money for two or three years, before he can have any return of profit; and even when his hops come to their bearing ſtate, and he flatters himſelf with being able to make good the charges he has been at, a bad ſeaſon may fruſtrate his expectation. Small parcels of hops, ſuitable to the abilities of the farmer, for even the pooreſt may eaſily ſpare time and labour to plant a few of them in a corner of his garden, or other ground, and to plant ſallows, willows, or aſh, for poles, in his hedges or elſewhere, will yield him pretty profit, without his laying out any money: ſo that, in ſetting forth the expences and riſk which attend the culture of hops, it is only meant to caution the huſbandman, whoſe circumſtances are not affluent, againſt embarking too far in this expenſive branch of agriculture.

Hops, like other vegetables, are liable to various accidents and diſtempers, the principal and moſt fatal of which are, the fly, the fen or mould, the mildew, and what the planters call fire-blaſts.

The Rev. Dr. Hales, who made many curious experiments on this plant, has obſerved, that it imbibed and perſpired an amazing quantity of moiſture, and that this perſpiration being ſtopped, or even impeded by any accidental cauſe, ſuch as a long tract of dry weather, followed by cloſe, foggy, and damp days, would hinder, in ſome meaſure, the kindly perſpiration of the leaves, whereby the ſtagnating ſap would be corrupted, and breed mouldy fen, which often ſpoils large portions of hop-grounds:

The planters of hops remark, that when a mould or fen, has once got poſſeſſion of any part of the ground, it ſoon over-runs the whole; and that even the graſs and other herbs under the hops, are infected with it. The reaſon probably is, that the exceeding ſmall ſeeds of this quick-growing mould or moſs (for ſuch in fact it is); coming ſoon to maturity, are eaſily blown over the whole ground; and it is undoubtedly owing to the ſame cauſe, that is, to the remaining diſperſed ſeeds of the preceding year's fen, that ſome grounds are infeſted with this diſtemper for ſeveral years running.

Particular care ſhould therefore be taken to keep the land always in fine tilth, and free from weeds, and to burn all the fenny hop-vines, in a place remote from the garden, as ſoon as they are picked. A forcing-pump for throwing water, with ſome violence, againſt the mouldy vines, and waſhing the leaves of the plants, will be of great ſervice, in deſtroying this moſs, or fen; and if, inſtead of pure water, a weak decoction of coarſe tobacco were made uſe of on theſe occaſions, it would moſt probably anſwer two purpoſes at once, by removing the fen, and deſtroying the fly and other inſects peculiar to hops. The force-ing engine may thus be repeatedly employed three or four times in a ſeaſon; for it may do great ſervice, and it never will injure the plants. I have already mentioned the powerful influence of tobacco in other ſhapes over inſects, and I cannot give a ſtronger proof of it, than what has been furniſhed to me by my worthy friend Mr. Small, who having in his window in the country, a beautiful geranium, which was nearly deſtroyed by a vaſt number of ſmall and almoſt tranſparent inſects, which fly a very little way, waſhed over part of this plant with a ſtrong infuſion of tobacco. The little inſects were not however killed thereby, but fled and covered the adjoining window with their numbers. Another waſhing completed the cure: there was no longer an inſect to be ſeen, and the plant, thus relieved, put forth freſh ſhoots immediately after, though then the 17th of November.

Mr. Small made another experiment of the ſame kind upon a myrtle, infeſted with a very different inſect, peculiar to that plant, and which adhered to the leaves like a louſe. He effected the cure of this by the ſame means as before.

I have related theſe circumſtances, in order to ſhew the hop-planter, what may be done by the proper application of a decoction or infuſion of tobacco. It is however to be obſerved, that this will not do after the plant is in flower; for it might then leave behind it a very diſagreeable and prejudicial flavor. As the hops bloſſom in autumn, they are more peculiarly liable to the breeding of inſects, or to their being invited by the ſweet moiſture; or the moiſture may ſo unite the bloſſoms together, as to render them unfit for uſe. A current of air from the ſouth-weſt is in this caſe highly neceſſary; and if ſuch current does not ſoon ſpring up, the plants ſhould be watered, without infuſion, by a forcing-pump, before the pernicious dew ſhall harden.

It has been alleged, that the mould, or fen, may be prevented in hop-grounds, by the uſe of hog's dung; and that it has been known to have cured fruit-trees attacked by this diſtemper. Mr. Mortimer gives an inſtance of an apple tree very much over-run with moſs, being entirely cured by making around it a ſtye, in which hogs were fattened: but ſor my part I attribute this cure, and indeed all others thus performed, to the health and vigour given to the plant by this copious manuring. In ſhort, the great ſecret with reſpect to the hop is, to have the ground in good heart, to ſtir it well, keep it very clean, uſe the forcing-pump frequently, and let it be well aired; and there is no great danger of unſucceſsful crops, in tolerable ſeaſons.

In confirmation of my ſyſtem, it is related by the authors of the *Journal Œconomique*, that a naturaliſt having been excited to examine the cauſe and nature of the mildew, he, with the aſſiſtance of a microſcope, perceived it to be full of the eggs of little inſects, which fly in vaſt numbers in the air while the hop is in bloſſom. Theſe inſects gnaw the leaves even of trees, and, like others of their ſpecies, undergo various metamorphoſes. This diſcovery induced him to believe that, as inſects are not apt to attack perfectly healthy trees, or vigorous plants, but ſuch only as are feeble and ſickly, the hog dung might give ſuch vigour to the hop, as to render theſe little animals afraid to attack it: for it has been remarked, that the inſects which nip a leaf, quit it as ſoon as they find in it an abundant juice, the ſalts of which, it may be preſumed, are too ſtrong for them; and that they fix on thoſe only which begin to decay, and loſe their ſap.

It is added in the ſame *Journal Œconomique*, that when hops are ſcarce, their leaves and ſprigs ought to be gathered, for ſeveral uſeful purpoſes: but they muſt be gathered with great care; no leaves ſhould be taken, but ſuch as are clean, young, whole, and green; and only the tips of the ſprigs that are green, young, and full of juice. They muſt be dried in a very clean and airy place.

Theſe may be uſed in brewing, for an after-beer, or for common ſmall beer: for by throwing in the leaves and ſprigs of hops, that beer acquires additional ſtrength, becomes the more wholeſome, and will keep the longer.

The leaves and ſprigs of hops are, during the exceſſive colds of winter, an excellent cordial to cattle, whom they ſtrengthen prodigiouſly.

The method of uſing them is, to infuſe them in boiling water, and to mix this infuſion with the ordinary drink of the cattle.

Reſpecting the fire-blaſt, which I conſider merely as a blight, occaſioned by ſultry ſun-ſhine, after ſhowers of rain: if that blight cauſes any decay in the plant, which may breed inſects; or if it leaves behind it, that thick honey-dew already deſcribed; the only probable remedies I know, for removing theſe evils, are what I have mentioned above.

SECTION II.

Of HEMP.

THIS plant and the ſeed from which it is produced, are already ſo well known in all countries, that it would be needleſs to deſcribe either of them here; though it may not be improper to remark, that the flowers and the ſeeds of hemp always grow ſeparately and on different ſtems, and conſequently on different plants, as this never has more than one ſtem proceeding from the ſame root.

The flower-bearing ſpecies, which is moſt frequently termed female hemp, ſhould more properly be called barren hemp, flowering hemp, or male hemp; ſince it is this which bears the *farina* *fœcundans*, or fecundating duſt, without being impregnated with which, the ſeed that grows on the ſtems of the other ſpecies would not come to maturity, or at leaſt would not be capable of producing plants, when ſown.

The other ſpecies, which bears the ſeeds, and is improperly termed male hemp, ſhould be called ſeed-bearing hemp, or female hemp; becauſe it is this which, with the help of the impregnation it receives from the *farina fœcundans* of the male, produces ſeeds capable of yielding plants of either ſpecies.

What may chance to be the proportion of male or female plants in a hemp-ground, cannot poſſibly be gueſſed, at the time of ſowing, as no ſort of mark can be diſcerned on the ſeeds, by which they might be diſtinguiſhed: nor indeed can any judgment be formed, till the males begin to flower, that is, till about two months after the ſowing; unleſs it be from a remark, which curious obſervers have made, that the male-hemp is more ſlender than the female, and that all its parts are more delicate: to which may be added, that the male plant is always moſt forward in its growth, and that it generally riſes about half a foot higher than the female; by which means the fecundating duſt is more eaſily conveyed to the ſeed-bearing, or female plants.

With regard to the climate that is ſitteſt for the growth of hemp, M. du Hamel has juſtly obſerved, in his treatiſe on Cordage, that this plant does not require much heat, but that temperate climates ſuit it beſt, and that it thrives very well even in pretty cold regions, ſuch as Livonia and Canada, which produce it in abundance, and very good. M. Marcandier is indeed of opinion, that though extremely hot countries are not favorable to its growth, yet, as this plant is but a ſhort time in the ground, it may be cultivated in any place that is habitable by men.*

The legiſlature of this country gave formerly a bounty for the importation of this article from North America, which, I ſuppoſe, is continued to our remaining colonies of Nova Scotia and Canada. The parliament of Ireland would do wiſely to give large encouragement to the culture of it, on the reclaimed bogs of that country, where it would ſucceed well, and might become a very great national object.

A good ſoil for hemp is a ſoft rich loam, eaſily brought into fine tilth, and it ſhould be well manured.

Land newly broken up is found to be peculiarly fit for this plant; but flat grounds lying on the ſides of rivers, and enriched by the ſediment or ſilth left on them when the waters overflow, are the beſt of all.

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* *Traité de la Culture du Chanvre.*

If hemp is to be ſown on very ſtrong ſoils, they muſt be brought into ſo good tilth, and be ſo well managed, that their mould may remain looſe: in which caſe, ſuch ſoils yield great crops. Dry lands are not fit for hemp: it does not riſe well in them, but remains ſhort and ſtunted in its growth, and its fibres are then generally woody, which renders them hard. All theſe are conſiderable defects, even for the coarſeſt works.

It is however true, that, in rainy years, it ſucceeds better on dry grounds than on moiſt: but according to the common run of ſeaſons, the beſt ſituation for this plant is certainly along the ſide of a ſtream, or a ditch ſo full of water, that the water may conſtantly be nearly on a level with the ſurface, but without overflowing it while the hemp remains on the ground.

This is exactly that ſort of ſituation, which hemp might have in reclaimed bogs, where it might alſo be manured by the ſilth or ſediment from the great drains.

It is the cuſtom in ſome countries, to form hemp grounds, which are appropriated ſolely to this purpoſe. Were that eligible in any ſituation, I think it would be in ſuch as I have juſt now mentioned; but in general I ſhould prefer a change of crops.

It has been commonly imagin'ed, that a crop of hemp impoveriſhes the ſoil where it grows: but this, I ſhould ſuppoſe, was rather prejudice; ſince the ground receives from it a very ample dreſſing of leaves, and the depth and ſpreading of the roots hollow the land ſo much, and leave it ſo looſe, that a crop of wheat may be taken immediately after the hemp has been pulled, without any other expence than ſowing the ſeed and harrowing it in; or if turnips, or a ſpring crop be more convenient to the farmer, theſe alſo will thrive well after hemp.

As it is eſſential to have the ground in exceeding fine tilth, the firſt plowing ſhould be given as deep and as early as poſſible, in autumn, and laid up rough, ſo as to be well mellowed and pulveriſed by the winter's froſt.

If the hemp is to be ſown on ground broken up on purpoſe, and which is covered with coarſe graſs or other ſimilar productions, its ſurface ſhould be pared and burnt, or otherwiſe prepared, according to the methods I have formerly mentioned. The ground ſhould be again plowed in February, or more early if the ſeaſon will permit; and then alſo the manure ſhould be laid on, whether of horſe-dung, or a compoſt formed with the ſcourings of ponds and ditches, when it is ripe.

Quick-lime, or marle, I ſhould eſteem a very great improvement to theſe compoſts.

To prepare the hemp-ground thoroughly for receiving the ſeed, it ſhould have two or three good plowings in the ſpring; for the more frequently the ground is ſtirred in the ſpring, the better the crop will be. If any clods of earth remain after all theſe plowings, they ſhould be broken by means of the ſpiky roller, which will reduce them completely at twice going over, if the land be perfectly dry before it be thus rolled.

The ſeaſon for ſowing hemp depends much on the quality of the ſoil. In dry, light land, it ſhould be ſown as ſoon as the danger of the froſt is over, in the latter end of April or beginning of May, that ſo it may get up early, and, by covering the ground, prevent the danger of drought. In wet, cold lands, it ſhould be ſown later; perhaps about the middle or latter end of May. But if the weather be ſtill unfavorable at that time, that is, either too dry or too rainy, it may be delayed even to the middle or end of June, with good hopes of a crop. This late ſowing has one advantage, that it gives an opportunity of plowing late, and of thus deſtroying the firſt growth of weeds.

If by any accident, the hemp grows very thin, ſo as to be in danger of branching out too much, and of becoming woody, this ſhould be an additional motive for keeping it clear of weeds, that it may remain for ſeed, which will be the better for the plants having ſtood thin.

The carle, or male hemp, which produces the *farina fœcundans*, ripens earlier than the fimble or female, generally by three weeks, or a month: but the time of the ripening of either depends much on the ſoil and ſeaſon. The male hemp is ripe, when it turns yellow at top and whitiſh at the bottom of the ſtem: but this ſort, in particular, ſhould be pulled before it is quite ripe: for if too ripe, its fibres will adhere ſo ſtrongly to the reed, as not to ſeparate without ſome loſs; neither will they be ſoft, and conſequently not ſo fit for domeſtic uſes, as thoſe of hemp that is pulled before it has attained to a perfect maturity.

The ripeneſs of the female or ſeed-bearing hemp is known, not only by the ſame ſigns as that of the male, but alſo by the ſeeds beginning to turn brown, and by the capſules which contain them beginning to open.

As ſoon as the male hemp is ripe, it is pulled ſtem by ſtem, and with caution not to injure the female hemp, which, as was before obſerved, muſt remain on the ground ſome weeks longer, till it alſo is ripe, and then it ſhould likewiſe be pulled ſtem by ſtem.

Each handful that is pulled ſhould conſiſt of plants as nearly as poſſible of equal length, and their roots in particular ſhould be placed as equally as can be. Some tie up each handful, eſpecially of the male-hemp, with a ſtalk of hemp, then lay it in the ſun to dry its leaves and flowers, which they afterwards beat off by ſtriking it againſt a tree or wall; they then put ſeveral of theſe handfuls together, ſo as to form a pretty large bundle, and in this condition they carry it to the watering place.

This is what M. du Hamel ſays of the common practice of drying the hemp before it is ſteeped: but it muſt be here obſerved, that it is a matter of doubt whether it ſhould be dried, or not. Thoſe who are for drying it firſt, ſay, that the hemp becomes ſtronger than when ſteeped without being previouſly dried. On the other hand, thoſe who are againſt drying, allege, that the fermentation * required will ſooner take place and

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* Wherever I have met with the word putrefaction applied to hemp when ſteeped, I have always changed it to fermentation, as

and proceed more equally, when the natural moiſture is left in the plant, and that the hardneſs it contracts in drying, is never after completely removed by the ſteeping. Experience alone, and not reaſoning, can determine ſuch a controverſy.

The common height of hemp, when full grown, is from five to ſix feet: but M. du Hamel remarks, that the ſtems of the hemp which is cultivated near Beſcheviller, in Alſace, are ſometimes upwards of three inches in diameter at their bottom, and above twelve feet high. Theſe, indeed, are ſo deeply rooted, that even a ſtrong man can hardly pull them up.

When the ſimble, or female hemp is let ſtand till its ſeed is perfectly ripe, its bark becomes woody, and ſo coarſe that no future operation can bring it to a proper degree of fineneſs. For this reaſon, it is generally pulled before the ſeed is quite ripe: but as it is undoubtedly the intereſt of the huſbandman to ſow the beſt ſeed only, he ought not to grudge ſacrificing the goodneſs of a ſmall portion of his hemp, to the ſuperior advantage of obtaining perfect ſeed, by letting it

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as it is no doubt this latter and not the former, which takes place by the ſteeping of hemp. It is well known, that all vegetables muſt have firſt a vinous, and ſecondly an acetous fermentation, before they become putrid, which is their laſt ſtage of corruption.

ſtand, till the ſeeds have attained full maturity. But the beſt way of having good ſeed and plenty of it from few plants, is, by cultivating them on a ſpot apart, and drilling or dibbling them in rows diſtant enough to be well hoed and earthed up, which will give uncommon vigour to the plants, and make them infinitely more productive both as to quantity and quality.

It is cuſtomary in ſome countries, to complete the ripening of the ſeed, to dig round holes, about a foot deep, and three or four feet in diameter, in different parts of the hemp-ground, and the handfuls of pulled hemp are ſet as cloſe together as can be in theſe holes, with their ſeed-ends downward, and their roots uppermoſt, after which, to keep them in this poſition, the whole is tied round with bands of ſtraw, and the earth that was taken out of the hole is thrown up all around this great ſheaf, ſo as quite to bury the heads of the hemp, which, when thus covered, heat, by means of the moiſture contained in them; in the ſame manner as a ſtack of green hay, or a heap of green weeds. This heat or fermentation completes the ripening of the hemp-ſeed, and diſpoſes it more eaſily to quit its huſks; and when it has been brought to this condition, the hemp is taken out of theſe holes, where it would become mouldy, if left longer in them. But if this heat is given to ſeeds from which the oil is to be expreſſed, perhaps there may be ſome danger of the oil's being made rancid, by its undergoing this operation.

In other places, where the crops of hemp are great, the huſbandmen do not bury the heads of their ſeed-hemp in the manner above deſcribed, but only lay it in heaps with the ſeed ends one againſt another: others, whoſe crops are ſmaller, content themſelves with ſpreading a cloth upon the ground to receive their hemp-ſeed; and others again, only ſpread their bundles on a clean ſpot of ground, with all the heads turned the ſame way.

The ſeed ends thus placed are beaten ſlightly, either with a ſtick or a light flail. The ſeed which falls out eaſieſt, is always the ripeſt and beſt, and ſhould therefore be reſerved for ſowing next ſpring: and as to that which remains in the heads of the hemp after this operation, it is got out by combing the heads on the teeth of a ripple, which pulls off the leaves, the huſks of the ſeeds, and the ſeeds themſelves, all together. Theſe are gathered in a heap, and left in that condition for a few days, in order that they may heat a little, after which they are ſpread out to dry, then they are threſhed, and finally, the ſeeds are ſeparated by winnowing and ſifting.

This ſecond ſeed is much inferior to the firſt, and accordingly it is uſed only for extracting oil from it, or for feeding of poultry.

Threſhing with a flail, is dangerous in bruiſing the ſeed and rendering it unfit for ſowing; to avoid which, the beſt way is to ripple the whole, and then ſeparate the heavy from the light, by throwing them in a barn, as wheat is thrown.

The method of laying hemp down to ſteep, is, to place it in bundles at the bottom of the water; then to cover it with a little ſtraw, to keep the dirt from ſticking to it, and then to load it with pieces of wood and large ſtones, to keep it down, ſo that it may be always five or ſix inches below the ſurface of the water.

The intention of ſteeping the hemp is, to make its bark part the more eaſily from the reed, and to deſtroy the outer ſkin. This is effected by a ſmall degree of fermentation; and it would be dangerous to let the hemp lie too long in the water, for it will then be over-ſteeped, that is to ſay, the water will have relaxed too much the cohesion of the fibres or threads of the hemp, and the ſtrength of thoſe fibres or threads would be thus greatly impaired. On the other hand, when the hemp has not lain long enough in water, its bark adheres to the reed, its fibres are hard, and they can never be rendered ſufficiently fine. There is therefore a medium to be obſerved; which medium depends, not only on the length of time that the hemp is to remain in the water, but alſo,

1. On the quality of the water; it being ſooner ſteeped ſufficiently in ſtanding water, than in a running ſtream, and ſooner in ſtagnant, putrid water, than in that which is clear.

2. On the temperature of the air; for it requires leſs time to be ſufficiently ſteeped in hot weather than in cold.

3. On the quality of the hemp; that which has been raiſed on a rich mould where it has not wanted for water, and which has been pulled while yet a little green, being ſooner ſteeped to a proper degree, than that which has grown on a ſtiff or dry ground, and which has ſtood till quite ripe.

In general, when hemp has been ſteeped but a ſhort time, its fibres are thought to be the better. Hence ariſes the opinion, that hemp ſhould not be ſteeped but in hot weather; and for this reaſon alſo it is that many, when the autumn is cold, defer the ſteeping of the carle till the ſpring. It is likewiſe for the ſame cauſe that ſome prefer ſteeping their hemp in ſtanding water, or even in ſtagnant water that is a little putrid, rather than in ſpring or running water.

M. du Hamel, to whom we are indebted for theſe remarks, ſteeped hemp in different ſorts of water, and it appeared to him, that the fibres of the hemp ſteeped in putrid ſtanding water, were ſofter than thoſe of the hemp ſteeped in running water; but in that, they contract a diſagreeable colour, which does not, indeed, do any injury to the hemp, for that which has been thus ſteeped, is the moſt eaſily bleached; yet, as this colour diſpleaſes, and the hemp is leſs ſaleable for it, endeavours are always uſed, if poſſible, to make a ſmall ſtream of water paſs through the ſteeping places, to refreſh them, and prevent their becoming putrid.

From experiments made by an agricultural ſociety in Britany, it was found, that all hemp ſteeped in running water was incomparably whiter than that of the ſame quality ſteeped in ſtanding water. That the hemp pulled before it was ripe, acquired the greateſt degree of whiteneſs. That the whole of the loſs of ſubſtance, upon ſumming up the waſte occaſioned by each particular preparation, was leaſt upon the whiteſt hemp; but that the hemp ſteeped in ſtanding water yielded a greater quantity of fine fibres, and the great loſſes in point of quantity fell only on the firſt dreſſing. That the hemp judged to be the beſt before it was hackled, did not preſerve its ſuperiority when hackled. That, that which was at firſt looked upon as only of a midling, or even of an inferior quality, proved to be the fineſt and beſt after it was hackled. This obſervation is of importance, eſpecially when the hemp is for naval uſes.

As it is contrary to law, that the places for ſteeping be made in running water, it would be of advantage to contrive them ſo, that the waſte water from theſe places ſhould run off upon paſture grounds; becauſe the quantity of putrid vegetable matter which this water will carry along with it, would greatly enrich thoſe grounds; and with this view likewiſe, all the water of pools or other places uſed for ſteeping of hemp, ſhould be thrown out of them upon the graſs, as ſoon as the hemp has been removed.

Care ſhould be taken, that the hemp be not laid to ſteep in water in which there are any animals that are apt to gnaw it; for theſe would totally deſtroy its fibres. Of this kind are, the creatures called freſh water ſhrimps.

The common method of judging when the hemp has been ſufficiently ſteeped, is, by trying whether the bark parts eaſily from the reed, and can be peeled off its whole length without breaking; for in this caſe it is thought to have been enough watered. However, it muſt alſo be allowed, that long practice enables the peaſants who cultivate hemp, to give it, generally, a due degree of ſteeping, though they do ſometimes miſtake:

but the ſureſt way to judge of it, is, to take ſome of the ſtems out of the water and to try whether the extremity of the roots ſnaps off ſhort, and whether the bark ſeparates clean from the reed, its whole length; for in theſe caſes it is certain that the hemp has been ſufficiently watered, and ſhould be immediately taken out. If the bark does not ſeparate equally, but ſtops at the ſmall knots on the ſtem, this ſhews it has not been ſteeped enough.

The uſual duration of the ſteeping of the male hemp is from three to ſix days, according to the weather; and of the female hemp, from five to eight or ten days: but as only a ſmall degree of too much or too little ſteeping is hurtful, it ſhould be attended to with great care.

Some injudiciouſly neglect to waſh their hemp when it is taken out of the water; thinking the filth upon it will dry and fall off of itſelf: but they do not conſider, that in the drying, this filth gives the hemp a bad colour, and that the duſt ariſing from it, is hurtful to the health of the workmen.

When the hemp is taken out of the water, the bundles ſhould be untied and ſpread upon ſand or rocky ground, or if neither of theſe be at hand, it may be laid on a field newly reaped and where the ſtubble remains ſtanding. The ſtubble will keep it hollow, and it will dry the ſooner. Some dry their hemp by ſpreading it out upright, againſt a ſunny wall, or laying it along the ſloping ſide of a ditch.

Graſs is not fit for laying it on, becauſe there will ariſe from thence a moiſture which will rot the hemp. For this reaſon it is, that the place where hemp is ſpread to dry, ſhould be as free as poſſible from damp. When the hemp is thoroughly dry, it is bundled up again, and carried home, where it ſhould be kept in a very dry place, till it is wanted for peeling or breaking.

The method of peeling hemp is extremely ſimple; even children, and the aged and infirm may perform it with eaſe, by only taking one ſtalk after another, breaking the reed, and ſlipping off the bark. This may likewiſe become the employment of every perſon belonging to the farm, in winter evenings, and at ſuch times as the weather prevents their working without doors. There are, however, ſome inconveniencies attending this method: the peeled hemp comes off in ribbands, which do not anſwer ſo well in the hackling, as that which has been broken; more of the uſeleſs membranes ſtill adhere to it, and by increaſing its weight, render it better for the ſeller than the buyer; beſides which, the hemp does not always peel off in equal lengths, and from thence ariſe conſiderable diſadvantage and loſs in its future dreſſings.

The hemp, which is to be broken, ſhould firſt be rendered very dry; becauſe the reed will then be more brittle, and therefore part the more eaſily from the bark. There are ſeveral ways of drying it, but I have not ſeen any deſcribed, that can anſwer this purpoſe ſo well as my kiln formerly mentioned for drying of hops, and for various other agricultural purpoſes. This kiln would require being prepared with bars of wood, the ſame as for hops; and perhaps even the hair-cloth might be of uſe in this laſt caſe, as well as in the former; nor could the hemp be injured either by the fire, or the vapours which it often creates.

Upon the bars of wood, or hair-cloth, the hemp ſhould be laid about five or ſix inches thick; a careful perſon ſhould attend to turn the hemp, ſo that it may be dried equally; and alſo to remove the dry, and replace it with freſh quantities, as occaſion may require.

Where only a ſmall quantity of hemp is to be dried, an oven is a very ſafe method; and when the hemp is to be dreſſed at home, it may perhaps be dried as faſt thus, as the other avocations of the family may make it neceſſary. Care, however, muſt be taken that the oven be not ſo hot as to endanger the fine and tender fibres of the hemp: for too great a heat may not only ſcorch them, but likewiſe ſo parch the oil in the hemp, that it will remain afterwards harſh and dry, and not be ſo eaſily whitened, as it might be otherwiſe.

By the operation of breaking hemp, is meant the breaking of the reed, which ſome call the bunn, or woody part of the ſtem, within the bark; for the bark itſelf, of which is made the filamentous ſubſtance, that is ſpun or uſed in manufactures, only bends under the hands of the dreſſer, and does not break. The breaking is performed in three ways; by beating the hemp with beetles, which is laborious and tedious; by the Dutch hand-break, which is preferable to the beetle; or by fluted rollers worked by horſes, wind, or water. This is by much the moſt expeditious way, but is attended with ſome expence in the conſtruction of the mill. I would therefore wiſh to recommend a machine of a much ſimpler conſtruction, which is formed by an upright axle, two mill-ſtones may be fixed to it following one another upon a circular oak-boarded floor; and the axle and ſtones may be turned by an arm or lever extending from the former, ſo as to give the proper diſtance for a horſe, or even men, to turn it. The hemp ſhould be ſpread on the oak-floor above mentioned, and placed in the way of the mill-ſtones as they turn; and when moved about, ſo as the ſtones may have paſſed over every part, that quantity ſhould then be withdrawn, and a new one put in its ſtead.

After the hemp has been broken, it undergoes a ſecond operation, which is commonly termed ſwingling or ſcutching. The uſe of this is, to ſeparate the reed from the hemp, and it is done in the following ways. In the firſt, the workman takes a handful of hemp in his left hand, and holding it over the edge of a board, ſtrikes it with the ſharpened edge of a long, flat, and ſtraight piece of wood, commonly called a ſwingle-hand or ſcutcher. Some recommend to have the cutting edge of the ſcutcher made of a circular form, that its greateſt force may fall on the middle of the hemp, and thereby ſpread it, by which means it will be more equally cleared of the remaining broken pieces of reed. But this method, being both laborious and tedious, water-mills have been erected, in which ſeveral ſcutches fixed in the ſame axle, are moved with great velocity. In theſe, the work is performed with expedition, and much leſs fatigue to the workmen; but greater waſte is made of the hemp, owing to the velocity with which the engine is turned.

Before the hemp, thus prepared, is hackled, it uſually undergoes a third operation, called beetling, the deſign of which is to looſen, and thereby more thoroughly ſeparate its fibres. The beetles uſed for this purpoſe are moved either by hand or by water.

It would be extremely foreign to my purpoſe to enter into any deſcription of the implements uſed in the manufacture of hemp: my province is huſbandry, and beyond its bounds I do not mean to go.

M. Marcandier propoſes, inſtead of ſcutching and beetling the hemp, to give it a ſecond ſteeping after it has been peeled or broken, the better to ſoften the bark that may ſtill remain hard, and not eaſily brought to a proper degree of fineneſs. For this purpoſe, the hemp intended to be ſteeped a ſecond time is divided into ſmall parcels: theſe are tied looſely round the middle with a piece of packthread, in order that they may be managed eaſily, without mixing or entangling them; and the hemp thus tied is laid in a veſſel full of water, where it is left more or leſs time, according to the hardneſs of its fibres, and the quantity of glutinous adherent matter ſtill remaining on it. Three or four days are always ſufficient for this purpoſe; but a leſs time will do, if the hemp wants only to be cleared of that adherent matter.

When it has been thus ſteeped long enough, it ſhould be waſhed very clean in a running ſtream; and if many of the fibres of the hemp are found to cling together in what our author calls ribbands, he adviſes to beat them in the manner linen is beaten in bleaching. It is ſafer to err in too little, than in too much ſteeping; becauſe, after the fibres have been looſened in the break, they will be the more liable to be deſtroyed by only a ſlight degree of fermentation. When the fibres of the hemp are ſufficiently diſengaged from each other, they ſeem, while immerſed in water, to be as completely dreſſed as if they had already paſſed through the hackle. After this watering, the parcels are opened, ſpread on a board, and laid in the ſun to dry.

M. Marcandier farther obſerves, from his own experience, that, after this preparation, the hemp may be again ſteeped in a lye of pot-aſh or wood aſhes, rendered perfectly clear of all filth. This will undoubtedly contribue to the removing of any ſuch matter ſtill remaining in the hemp, as muſt neceſſarily fall off in the future preparations, before the manufacture made of the hemp be fit for uſe. And indeed a lye of this kind, bids fair to be of ſervice in the preparing of flax as well as of hemp; becauſe, both being thereby perfectly freed from every particle which muſt otherwiſe fall off in the future operations of hackling, ſpinning, bleaching, &c. the cloth or other manufacture made of them, will be proportionably better and more durable. The time taken up in bleaching will be hereby much ſhortened.

In the whole of this proceſs, the water ſhould be warm; becauſe warm water is ſofter, and acts more powerfully than cold, in diſſolving the impurities which are to be ſeparated from the hemp; and it is alſo an indulgence to people employed in this buſineſs, who might otherwiſe be more apt to ſlur over their work. It will therefore be adviſeable to perform this operation in warm weather, to ſave the expence of heating the lye.

M. Marcandier having experienced the efficacy of horſe-cheſnuts in the bleaching of linen, and cleanſing of woollen ſtuffs, made likewiſe uſe of an infuſion of them in water, as a lye for preparing hemp in the manner above deſcribed. The method of preparing this lye is, to peel the cheſnuts and raſp them as fine as poſſible into ſoft water, in the proportion of two or three nuts to every quart of water. This is done ten or twelve hours before the mixture is to be uſed; and in the mean while, it is ſtirred from time to time, the better to diſſolve theſe raſpings and impregnate the water. The laſt ſtirring is given about a quarter of an hour before the water is drawn off from the thicker part of the raſpings which ſubſides; and this is done, either by inclining the veſſel and pouring the lye gently off, or by ladling it out by hand, while the water is yet white, and froths like ſoap-ſuds. In order to uſe this lye, it is made rather hotter than the hand can well bear, and the hemp is then ſteeped and waſhed in it as in ſoap-ſuds.*

The hemp thus prepared is carefully dried, laying the fibres ſmooth, and as little intermixed as poſſible. When dry, it is doubled, and twiſted at the ends, or tied up in bundles. The farther buſineſs of the hemp-dreſſer need only be an eaſy beating of the hemp, and that chiefly to ſeparate the fibres that may have clung together in the drying, and to the common operations of the hackle.

The danger ſo often fatal to the dreſſers of hemp, from the duſt drawn in with their breath, will be thus in a great meaſure avoided; and the hemp ſo prepared will be white, ſmooth, ſoft, and flexible.

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* The ſame gentleman likewiſe informs us, that linen may be waſhed in the above mentioned lye: and that even when very dirty, much leſs ſoap will be required, than is commonly uſed, it being ſufficient to rub the dirtieſt part only, with a little ſoap.

He adds, that the raſpings of the cheſnuts which ſink to the bottom of the lye, are good food for fowls and pigs.

The ſame author extols highly the various uſes to which hemp thus prepared, and even its tow, or what is ſeparated from it by the hackle, may be applied. This hemp, he informs us, may be dyed like ſilk, wool, or cotton, and may be made into cloth, ſtuffs, and garments of all kinds; and that a great advantage attending the uſe of this material is, that it will not be deſtroyed by thoſe inſects which devour woollen cloth. Theſe advantages attending hemp thus prepared, if they have not already been adverted to by our manufacturers at Mancheſter, &c. are certainly well worthy of their particular attention.

M. du Hamel gives the following directions for judging of the quality of hemp, that has been dreſſed, and is ready for manufacturing.

It is of conſequence that the hemp in bales, for ſo it is always packed, be not damp; becauſe it would then weigh heavier than it ought, and would be apt to contract a heat, which might end in rottenneſs. The hemp in each head, or bundle, ſhould be as nearly as poſſible of equal length, and diminiſh gradually from the root end to the point. That which has been broken is ſofter, and its fibres are more ſeparated than that which has been peeled. From hence it would ſeem as if this hemp might be wrought up with leſs loſs of ſubſtance than peeled hemp; but yet, in fact, it generally yields the greateſt quantity of refuſe; not only becauſe it is never ſo well cleared from the reed, but alſo becauſe its fibres being mixed and entangled with each other, a greater number of theſe are broken when it is hackled. It is, however, on the whole, moſt probable, that breaking may be the beſt way of dreſſing very hard and ſtrong hemp, becauſe the break certainly contributes greatly to render it ſoft and fine.

Too great a ſtreſs is ſometimes laid on the colour of hemp: that which is of a ſilver or pearl colour, is reckoned the beſt; that which has a greeniſh hue is likewiſe deemed good; that which has a yellowiſh caſt is leſs eſteemed; and the dark colour only is rejected: but at the ſame time, it ſhould be obſerved, that the colour of hemp depends chiefly on the ſort of water in which it has been ſteeped, that being dark which has been ſteeped in ſtanding water, and that light coloured which has been ſteeped in running water; and therefore, that the colour of the hemp does not in fact deſerve very great attention; unleſs it be black, or of a very dark brown. In theſe caſes indeed, it may be preſumed, that the hemp has either been ſteeped too much, or that it was packed up ſo moiſt as to have been heated in the bale. The ſmell of the hemp is more to be relied on, than its colour; and of conſequence, that which has a rotten, mouldy, or heated ſcent, ſhould be abſolutely rejected; whilſt that which ſavours ſtrong of the natural ſmell of the hemp ſhould be preferred, becauſe this indicates it to be of the growth of the laſt crop; a circumſtance which is much attended to in the rope yards; becauſe, new hemp is found to waſte much leſs in the working, than old; though it is certainly true, that it does not hackle ſo fine.

In general it may be laid down as a rule, that the hemp which feels ſofteſt, and whoſe fibres are the fineſt and moſt equally ſeparated, is the beſt.

The Rev. Mr. Mills, in his account of the culture of hemp, adviſes working the land well, and then giving it thirty loads per acre of good manure about a fortnight before ſeed time, which he confines to the month of April: but I have given a much greater latitude, I believe without danger of ſuffering by it.

The ſooner it is ſown, ſays Mr. Mills, the ſeaſon permitting, it will be the better, though it has been ſometimes deferred till the 15th of May. Three buſhels and a half of good bright ſeed are ſufficient for an acre, and ſhould be gently and lightly harrowed in. The birds muſt be kept off the land till the plants appear: the time of pulling is about the beginning of Auguſt, or, more properly ſpeaking, thirteen weeks from the time of ſowing: the leaves turning yellow and the ſtalks white, are ſigns of its maturity; the male and female hemp are pulled together: indeeed when the crop is thick, it is impoſſible to ſeparate them. The expence of pulling is generally eſtimated at one ſhilling per peck, according to the quantity originally ſown.

When it is all taken up and bound in ſmall bundles, with bands at each end, to ſuch a bigneſs as may be graſped with both hands, it is conveyed to a pond of ſtanding water, if a clay pit, the better, where it is laid in layers, one croſſing the other, which is termed a bed of hemp; and after it is piled to ſuch a thickneſs as to anſwer the depth of the water, which ſhould not exceed four or five feet, it is loaded with blocks and logs of wood, till all is totally immerſed: after remaining in this ſtate four or five days, as the weather ſhall direct, it is taken out and carried to a field of aftermath, or any other graſs, that is clean and free from cattle;* the bundles being untied, it is ſpread out thin, ſtalk by ſtalk; in this ſtate it muſt be turned every other day, eſpecially in moiſt weather, leſt the worms ſhould injure it: thus it remains for ſix weeks or more; then it is gathered together, tied in large bundles, and kept dry in a houſe till December or January, when the ſtalks are broken, and the bark wholly freed from them by an inſtrument called a breaker. The art of breaking it, by a labourer of common capacity, would be learned in a few hours, and the ſwingling of it, which follows, requiring ſome ſlight as well as labour, though more difficult, might, in a little longer time, be acquired. After breaking and ſwingling, it is ſent to the hackler and hemp-dreſſer, to be prepared for ſpinning, according to the fineneſs deſired.

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* I have already obſerved, that a field of graſs is not the moſt favorable ſituation for ſpreading of hemp.

Should the hemp ſtand for ſeed, the yarn of it will never be ſo white, as it is not watered, but only ſpread on the graſs for the benefit of the dews: it will not be improper to obſerve, in this caſe, that after it is tied in bundles, it is ſet up like wheat in ſtacks, till the ſeed will freely ſhed, and then is threſhed out.

The hemp when it comes from the brake is tied up in ſtones, which will fetch from ſix ſhillings to ſeven ſhillings and ſix-pence each: in the year 1787, it ſold as high as nine ſhillings. The produce is ſo variable and uncertain, that, in one ſeaſon, a rood and ſix perches of land has produced ſeventeen ſtones, and in another, with the ſame culture and manure, only twelve.

The expences of cultivation may be thus eſtimated;

Rent of an acre of land	£ 1	0	0
Plowing and ſowing, &c.	0	10	6
Three buſhels and a half of ſeed, ſuppoſed at one ſhilling and ſix-pence per peck	1	1	0
Boy keeping off birds, one week at leaſt	0	1	6
Pulling, at the rate of one ſhilling per week, according to the ſeed ſown	0	14	0
Getting it in and out of water, turning, and laying up	1	1	0
	£ 4	8	0

Tithe and town charges not eſtimated.

The expence of breaking hemp is from one ſhilling to one ſhilling and ſix-pence per ſtone; the dreſſing at the hackler's, one ſhilling and ſix-pence per ſtone; and the ſpinning, according to the fineneſs, from ſeven-pence to one ſhilling per clew. A clew is three ſkeins, a ſkein is twenty leas, a lea is forty threads, a thread is two yards when reeled. The weight of a clew varies with the fineneſs or coarſeneſs of the thread.

But to continue the above account.

Tithe and rates, ſuppoſe	£ 0	6	0
The loweſt crop mentioned is forty-eight ſtones per acre, let us ſuppoſe only forty, breaking, at one ſhilling and three-pence	2	10	0
Expences,	£ 7	4	0

Produce.

Forty ſtones, at ſeven ſhillings	£ 14	0	0
Parliamentary bounty, at three-pence	0	10	0
	£ 14	10	0
Deduct expences as before	7	4	0
Nett profit per acre*	£ 7	6	0

The Society of Arts in London, having received ſome Chineſe hemp ſeed from the Eaſt India Company, diſtributed ſmall quantities of it to thoſe members who could moſt conveniently make experiments on the culture of it.

Amongſt others, ſome of it was given to the Rev. Dr. Hinton, of Northwold, near Brandon, who, ſowing it, found the crop fail from the age of the ſeed, which from the length of the voyage, had been too long kept; a circumſtance extremely hurtful to hemp-ſeed. So much grew, however, as to enable him to make trial of it a ſecond year, with freſh ſeeds which he had ſaved, This ſeed was ſowed the 10th of May, 1787, on good land in high condition, and on the 19th there was a plentiful ſhoot of healthful plants, which grew vigorouſly all the ſeaſon. Auguſt 13th, the carle or male hemp was drawn, as on October 9th was the fimble or female hemp. The produce was after the rate of ninety-five ſtones

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[*] Young's Annals of Agriculture, No. 51, p. 376.

ſeven pounds, and three ounces; and of ſeed, eleven buſhels, two pecks, and half a pint per acre; whereas the general produce in the ſame neighbourhood ſeldom exceeds ſixty ſtones per acre. Dr. Hinton adds, that he was not qualiſied to judge comparatively of the quality of Engliſh and Chineſe hemp; but that in point of quantity, the latter had certainly the ſuperiority.

SECTION III.

Of FLAX.

THE ſpecies of this plant which is cultivated for uſe, is the *linum ſativum* of C. Bauhin, p. 214. Its ſtem, which is round and hollow, grows erect to the height of about two feet, and then divides into ſeveral branches: theſe are terminated by blue flowers, conſiſting of five petals, and are ſucceeded by capſules divided within into ten cells, in each of which is encloſed a bright, ſlippery, elongated ſeed. Its leaves are long, narrow, ſharp pointed, and placed alternately along the ſtem and branches.

The ſoil for flax ſhould be a ſtiff loam, rendered fine by tilth, and ſituated in a valley bordering upon water; or ſuch a ſoil as is thrown up by rivers, as before recommended for hemp. If there be water at a ſmall depth beneath the ſurface of the ground, it is thought to be ſtill better; as is the caſe in Zealand, which is famous for its flax; and where the ſoil is deep and ſtiff, with water almoſt every where at the depth of a foot and an half or two feet underneath it. It is ſaid to be owing to the want of this advantage, that the other provinces of Holland do not ſucceed equally well in the culture of this uſeful plant. Not but that fine flax is alſo raiſed on high lands, if they have been well tilled and manured, and if the ſeaſons are not very dry.

In the letters which the Dublin Society have publiſhed on the culture of flax, it is remarked, that moiſt ſtiff ſoils yield much larger quantities of flax, and far better ſeed, than can be obtained from light lands; nay, that the ſeed procured from the former may, with proper care be rendered full as good as any that is imported from Riga or Zealand: but, M. du Hamel is of opinion, that ſtrong land cannot produce ſuch flax, as what grows on lighter ground.

In ſouthern countries, the huſbandmen who raiſe flax, ſow part of their ſeed in September and October; ſo that the plants which ſpring from thence remain of courſe in the ground all the winter; and this is well judged in theſe planters, becauſe plants which have not covered the earth well before the heat of ſummer comes on, are apt to be parched in that dry ſeaſon. They ſow linſeed again in the ſpring; but this does not yield an equally abundant crop: however, the flax which it produces is more eſteemed, becauſe it is finer than that ſown in autumn. But in places where the winters are ſevere, and where the flax, which is a tender plant, would be in danger of ſuffering from froſt, it is the practice to ſow the ſeed about the end of March or beginning of April.

The land which is intended for flax ſhould be brought into exceeding fine tilth by repeated plowings, and ſhould be enriched by a manure ſuited to the quality of the ſoil. Thus, when a paſture is newly broken up, it ſhould be ſummer fallowed, and an ameliorating, horſe-hoeing crop taken, before it will be fit for flax. The Livonians, when they clear wood-land, burn the wood upon it, then plow it, and prefer it in this ſtate to any other kind of ſoil, for flax.

If the ground on which flax is to be raiſed has been long in tillage, it ſhould be plowed up deep before winter, and be laid up in high ridges or bouts, in order that the winter's froſts may moulder and mellow it.

In the month of February, if the land be not too wet, ſome very rotten dung ſhould be laid in the furrows, and immediately covered over. In March, for ſouthern countries, or in the beginning of April where the climate is colder, another plowing ſhould be given to lay the land ſmooth: the clods ſhould be broken by hand, and the ſeed ſhould then be ſown and harrowed in, with a light, or buſh-harrow, ſo as not to bury it above an inch deep. If the ſoil be moiſt and cold, a little pigeons dung may be ſown with the ſeed; for it agrees admirably well with the flax: but this muſt not be done if the ground is very light and dry. If the ground be very wet, it ſhould be laid out in beds of thirty or forty feet wide, ſeparated by trenches to drain off the water; and if the ground be level, the water may be allowed to remain in the trenches within nine inches or a foot of the ſurface of the beds.

Moſt of our lin-ſeed is brought from the north, namely, from Riga and Zealand: but we may ourſelves raiſe it very good, by following the directions here given.

Lin-ſeed is reckoned good, when it is large, oily, and of a good colour. To know whether it be oily, a few grains of it are thrown into a red-hot fire-ſhovel, and they in that caſe crackle almoſt inſtantly, and blaze briſkly. If it be ſufficiently heavy, it will ſink to the bottom in water; and to judge whether it be new, a certain number of ſeeds, exactly counted, ſhould be ſown on the end of a hot-bed, and notice taken whether they all grow.

When the goodneſs of the ſeed is known, more or leſs of it is to be ſown according as the huſbandman intends either to raiſe a quantity of lin-ſeed for ſowing, or to have very fine and ſoft flax. In this laſt caſe, the ſeed ſhould be ſown pretty thick, in order that the plants may riſe the cloſer together; by which means they will grow ſlender and tall, which adds much to the fineneſs of the fibres. If the lin-ſeed be ſown with an intention to let the flax remain for ſeed, a much leſs quantity of it ſhould be uſed, that ſo the plants may come up thin, and thereby have room to grow to their full vigour and extent. As ſtrong ſoils ſhould be choſen for this purpoſe; it might be moſt adviſeable to ſow it in drills, and horſe-hoe the intervals. Plants thus raiſed, have been found to produce great plenty of excellent ſeed. Some ſow, with their lin-ſeed, annual and perennial graſs ſeeds, when they intend to lay the land down to paſture. The plants grow but weakly under the flax; which, however, they do not hurt; but as ſoon as the flax has been pulled, they increaſe apace, and produce abundantly.

Flax is ſometimes damaged by inſects, when it is about three or four inches high. It is ſaid, that they may be deſtroyed by a ſlight ſtrewing of ſoot, aſhes, &c. At all events, it is certain that this dreſſing will give vigour to the plants, though it ſhould not kill the inſects. It is highly probable, ſhould theſe fail, that this inſect, like that which infeſts turnips, may be deſtroyed by nocturnal rolling, which will not hurt the young flax.

If any weeds appear among the flax, as is generally the caſe, they muſt be rooted out; and that the flax may be as little damaged by this as poſſible, the weeders ſhould work bare-footed: they may indeed ſit down upon the flax, for that will do it no harm, but treading on it, with the heels of ſhoes would kill many plants.

The fineſt flax is moſt liable to be laid, particularly in countries ſubject to ſtorms. To guard againſt this accident, the beſt way is to run ſmall ropes acroſs the field, both ways, and to tie them where they interſect at right angles, and faſten them by ſtakes at due diſtances, which will form a kind of netting that will protect the plants againſt almoſt any tempeſt.

Opinions are divided in regard to the degree of ripeneſs, at which it is beſt to pull flax. But in this, as in moſt other caſes, extremes ſhould certainly be avoided; and it ſeems reaſonable to think, that the moſt proper time for pulling it is, when its ſtalks begin to turn yellow, when its leaves begin to fall, and when its ſeeds begin to grow brown.

As ſoon as the flax is thought to have attained to a due degree of maturity, it is pulled, generally by handfuls: but as it is ſeldom all equally ripe, or equally ſtrong, it would certainly be adviſeable to pull firſt the ripeſt and ſtrongeſt plants, and then the weakeſt and leſs ripe; for thus they would be ſeparated at once, which is of eſſential ſervice in the watering; becauſe, the weak and green flax requires much leſs ſteeping than the ſtronger and more ripe. All weeds, and the earth which adheres to the roots of the plants, ſhould be carefully taken away, and then the handfuls of flax ſhould be laid regularly on the ground.

As the flax is pulled, it is laid together by handfuls, with the ſeed ends turned towards the ſouth. Theſe handfuls ſhould neither lie quite in a line with each other, nor directly acroſs, but a little ſlanting upward, ſo that the air may eaſily paſs through them. Some, inſtead of this method, tie the handfuls of flax looſely at the top, then ſpread out their roots, and thus ſet ſeveral of them together, upright upon their roots: thus it remains two or three days: or even one day will be ſufficient in very dry weather; after which it is rippled.

If any flax is raiſed on purpoſe for ſeed; or if, through the dryneſs of the ſeaſon, or the badneſs of the ſeed that was ſown, the flax is come up very thin, ſo as to ſhow evidently, that the ſeed which it may produce will be more valuable than the reſt of the crop; in either of theſe caſes, the flax ſhould be let ſtand, till its ſeed is perfectly ripe; thus ſacrificing the flax itſelf, to the then greater advantage of having good ſeed.

In order to ripple the flax, which is the next operation, a large cloth ſhould be ſpread on a convenient ſpot of ground, with the ripple placed in the middle of it. The manner of performing this work is ſo well known, that there is no need to deſcribe it here. Its purpoſe is, to obtain the lin-ſeed, which is always of conſiderable value, even though the flax has been pulled before its perfect maturity.

After the flax has been rippled, the ſeed ſhould be ſpread in the ſun, to dry. Thoſe which ſeparate from the pods, of their own accord, are the fulleſt and ripeſt, and ſhould therefore be ſet apart, for ſowing, in caſe the precaution of raiſing flax purpoſely for ſeed has not been attended to. The pods, or capſules, are then broken, either by treading or by threſhing, in order to get out the remaining ſeeds, the whole of which, as well as the former, ſhould be carefully ſifted, winnowed, and cleaned. When the ſeed is laid up, it muſt be frequently ſtirred, or ventilated, to prevent its heating. Even this ſecond ſeed affords a conſiderable profit, by the oil which it yields, and alſo by being afterwards made into cakes for fattening of cattle, or for manure. They are however thought to make the fat of cattle yellow: for which reaſon it is adviſed not to give them oil-cakes, till within a few weeks of their being killed: or, which is better, after they are fattened with the oil-cake; take off the effect of this food, by giving them ſome other, for a few weeks before they are killed.

As ſoon as the flax has been rippled, it ſhould be carried to the watering place. The different kinds ſhould now be ſeparated, if not done before; otherwiſe, ſome of the flax may be rotted in the water before the reſt will be ſufficiently ſteeped.

The choice of the water for ſteeping, is thus very properly pointed out in the directions for raiſing flax, publiſhed by order of the Commiſſioners for Fiſheries, Manufactures, and Improvements, in Scotland.

All flax ought to be watered in canals, which ſhould, if poſſible, be dug in clayey ground; becauſe it will beſt retain the water: but if a firm or retentive ſoil cannot be got, the bottoms and ſides of the canals ſhould be well lined with clay.

"A canal of forty feet long, ſix wide, and four deep, will generally water the produce of an acre.

"It ſhould be filled with ſoft water from a river or brook, and if poſſible, two or three weeks before the flax is put in. The greater way the river or brook has run, the water will be the ſofter, and therefore the better. Springs, or ſhort runs from hills, are too cold, unleſs the water be allowed to ſtand long in the canal. Water from coal or iron is very bad for flax. A little of the powder of galls thrown into the water, will immediately diſcover if it comes from minerals of that kind, by turning it into a dark colour, more or leſs tinged in proportion to the quantity of vitriol contained in it.

"The canal ought not to be under any ſhade; becauſe this, beſides keeping the ſun from ſoftening the water, might render ſome parts of the canal cooler than other parts, and thereby make it water the flax unequally.

"The flax raiſer will obſerve, that when the water has been brought to a proper degree of heat, by the ſun, ſmall plants will riſe quickly in it, numbers of ſmall inſects and reptiles will generate there, and bubbles of air will riſe up to its ſurface. If no ſuch ſigns appear, he may conclude that the water is not warm enough, or that it is otherwiſe unfit for flax."

Running water is not fit for ſteeping flax; becauſe, it prevents that degree of fermentation, which is neceſſary to ſeparate the fibres from the reed; and beſides this, in ſuch ſtreams, the flax is apt to be carried away by ſudden floods, or to be filled with the mud and ſlime, which thoſe floods bring with them: but to have a ſmall rill of water paſs through the ſteeping place is very adviſeable, becauſe it will ſupply the loſs of that which is evaporated. Stagnant water which is naturally of a bad colour, ſhould likewiſe be avoided; becauſe this communicates to the flax, which is not afterwards eaſily got rid of.

The flax, after it has been rippled and ſorted, as before mentioned, ſhould be tied very ſlack, with a band made of a few ſtalks, in bundles not larger than a man can eaſily graſp with both his hands, in order that the water may the more equally penetrate through them; and in this condition they ſhould be put into the canal, ſloping, or half-ſtanding upon one end, which, ſay the Edinburgh Directors, ſhould be the ſeed end, and of courſe the root uppermoſt; becauſe, add they, when the ſeed ends are uppermoſt, there frequently breeds a great deal of vermin deſtructive of the flax, and this they aſſure us is effectually prevented by putting the ſeed-end downmoſt. However this may be; the flax, when put into the water, ſhould be covered with ſtraw, or fern, upon which a wicker hurdle and ſome ſtones may be laid to keep it down, but without preſſing too hard againſt the bottom. It is a common opinion, that if the flax is not thus covered, the ſun will diſcolour it, even though it be quite covered with water.

More or leſs time is requiſite for the ſteeping of the flax, according to the nature of the water, the heat of the air, and the greater or leſs degree of woodineſs of the flax. It is ſteeped ſooner with a ſouth, than a north wind; and that which has been pulled green is alſo much ſooner ſteeped, than that which has been pulled very ripe.

It is therefore difficult to fix a preciſe time for its remaining in the water. The way to know when it has been ſufficiently ſteeped, is to draw a few ſtalks from out of the middle of the heap, and then try it: if the reed ſnaps ſhort, without bending, and if the bark parts eaſily from the reed, towards its point, it is enough ſteeped, and muſt in this caſe be taken out of the water immediately; for otherwiſe it will become too tender, and begin to rot.

The Livonians, when they would have flax or hemp of a ſuperior quality, chuſe a ſpot where there is a fall of clear water, and there make five or ſix baſons, or reſervoirs, one under another, each of which is from one to two feet deep. The water can either be let run from one baſon to another, or be ſtopped at pleaſure. The baſons are ſeparated by ſlight banks; and in each bank is a little opening, which may be cloſed whenever it is thought proper. To prevent the ſtream from overflowing the baſons ſucceſſively, it is itſelf turned aſide by a ſmall bank of clay; and this bank is opened whenever the water is to be renewed in the baſons.

The Livonians put their hemp and flax, firſt into the uppermoſt baſon only. At the end of two, three, or four days, they remove it into the ſecond baſon, from thence into the third, and ſo on, till they have brought the ſeveral bundles of theſe plants down into the loweſt. At each of theſe ſhiftings the firſt baſon is filled with freſh flax, and the water is renewed in all the baſons. This method of proceeding agrees perfectly well with that preſcribed by the Truſtees in Scotland; and by theſe means the ſteeping is not completed till the flax or hemp has paſſed through all the baſons, and has remained a proper time in the lowermoſt. Neither the Engliſh nor Dutch import any hemp from Riga, but what has been ſteeped in this manner; whereas the French take, at a lower price, what has been ſteeped in ſtagnant waters.

When the flax is taken out of the water, the bundles of it are ſpread out like a fan, at the root end, and laid on a dry new-mown meadow, that it may dry, bleach and become ſupple. It is there turned from time to time, and is carried off when quite dry; otherwiſe the moiſture of the dews would have the ſame effect, as if it had remained longer in the water.

The diſadvantage of laying the flax on long graſs is pointed out in the directions for raiſing flax, publiſhed by the Truſtees for Manufactures, &c. in Scotland, where they adviſe the huſbandman, by no means to follow this method, becauſe the graſs growing through the flax frequently rots it. Theſe gentlemen recommend ſhort heath for ſpreading flax, after it has been taken out of the water; for if it is wet, it faſtens to the heath, and is thus prevented from being moved by the wind; at the ſame time it is kept a little above the ground, and is thus more equally expoſed to the air and weather: but grounds expoſed to violent winds ſhould be avoided.

The flax, continue they, muſt be ſpread very thin upon the ground, and as it is then tender, it muſt be gently handled. The thinner it is ſpread, the better: the Livonians are particularly attentive to this, ſo as never to have above three ſtems upon one another: it ought never to be ſpread during a heavy ſhower, becauſe that would waſh and waſte the bark, which is then very tender, though it ſoon becomes firm enough to bear the weather, and then the more rain and ſunſhine it gets, the better it will be.

The ſkilful huſbandman ſpreads his firſt row of flax at the end of the field from whence the moſt violent wind commonly comes, placing the root-end foremoſt: he makes the root-ends of every other row over-lap the ſeed-ends of the former row three or four inches, and binds down the laſt row with a rope; by which means the wind does not eaſily get below the flax; and as the ſeed-ends are ſeldom ſo fully watered as the root-ends, this overlaying is like giving the ſeed-ends more watering.

The flax is judged to have been ſufficiently graſſed, when it is of a clearer colour than before, when its bark is bliſtered up, when that bark parts eaſily from the reed, and when the reed becomes very brittle: but no written deſcription can poſſibly convey a knowledge of this point, at all equal to that which is acquired by experience.

The whole of the flax ſhould be ſufficiently graſſed, before any of it is lifted; for if a part be lifted ſooner than the reſt, that which remains will be in great danger from the winds.

A dry day ſhould be choſen for taking up the flax; and if there be no appearance of high wind, it ſhould be looſened from the heath or graſs, and left looſe for ſome hours, to make it thoroughly dry.

As a great quantity of flax can ſcarcely be all equally watered and graſſed, and as its different qualities will beſt appear at lifting it off the graſs, each different kind ſhould then be collected together, and kept by itſelf, that is to ſay, all of the ſame colour, length, and quality.

The ſmaller the bundles are into which the flax is made up, the better they will be for drying, houſing, &c. and in making up theſe bundles, as in every other operation upon flax, it is of great conſequence, that all the ſtems be laid together as they grew, that is, root-ends to root-ends, and ſeed-ends to ſeed-ends.

The Livonians, cut off the roots of their hemp, but not of their flax, when it is taking out of the ſteeping baſons. They then tie the flax or hemp up in bundles about as thick as the lower part of a man's thigh. Theſe bundles are placed upright, and ſupported by a ſtake, around which a few of the tops of theſe ſtalks are twiſted, the better to ſecure them from falling. They are left in this ſituation one day, to drain; they are then ſpread on the graſs, for one or two days, and after this they are laid in heaps, and covered over with haulm, ſtraw, or ſome ſuch covering, to make them ſweat. When the hemp or flax has ſweated enough, it is laid in heaps in the ſhade, and there dried: but theſe heaps muſt not be ſo thick, but that the air may penetrate into them. It is on this laſt operation, that the good or bad quality of the hemp or flax thus managed chiefly depends. Both of them may be kept two or three years, and even longer, upon their reeds, after they have been thus prepared; and when it is intended to break them, after this keeping, they are put into an oven properly heated.

In the common way, after the flax has been graſſed, it muſt be dried by heat, to make its reed break readily and ſeparate the more eaſily from the bark. To guard againſt the danger of fire, this buſineſs ſhould be performed in a place diſtant from any other building.

The general method of drying flax is, in ovens. The Livonians make theirs of clay, bricks, or hewn ſtone. Thoſe which are built with clay, are ſometimes large enough to contain eight hundred bundles at a time: but it is more common to make them only for two, three, or four hundred. They are ſhaped like the ovens for an army, that is to ſay, they are very high arched. They require no greater degree of heat than is given with dead wood, furze, broom, &c. and what is juſt ſufficient to render the reed of the flax brittle; and the ſame of hemp, for the Livonians uſe them for both theſe plants, the bundles of which they ſet upright in them, and as ſoon as they take them out of the oven, they carry them to a kind of mill, to be broken.

The Dutch likewiſe dry their flax in ovens: their dimenſions are generally about fifteen feet in length, ten feet in breadth, and five feet in height: the roof is arched, and the entrance, which is juſt large enough to admit a man with tolerable eaſe, is made to ſhut cloſe, with a wooden door. This oven is not heated with wood, excepting at firſt; for after the workmen have begun to dreſs the flax, the broken reeds and other refuſe parts, which are beaten off it, and ſwept up, ſuffice to continue the heat; ſo that each parcel affords firing for the next, till the whole is dried. The Dutch kindle the fire in the oven, ſome hours before the day's work is over. The ſweepings of the flax light eaſily, and the oven heats and cools again, ſufficiently, before the breaking and ſcutching is finiſhed. They fill it when they leave work, and the next day, when they return, they find the flax dry, and fit for breaking. The flax breaks beſt and moſt eaſily whilſt it is a little warm and criſp: conſequently, the working is then cheapeſt; and accordingly, the Dutch never draw two bundles together from the oven, but take them one by one as they want them. I need not obſerve, that when the oven is heated, it muſt be well cleaned before the flax is put in; for the leaſt ſpark will ſet the flax on fire, and this would be a conſiderable loſs, as theſe ovens hold a great deal. It is for this reaſon, that I would wiſh to recommend the drying floors, I have before deſcribed, as fit for ſeveral uſeful purpoſes, and for this particularly; becauſe, they are exempt from all dangers from fire.

In Britany, they dry their flax in the common ovens; only letting them cool after the bread has been drawn. The impatience of thoſe who do this buſineſs is ſuch, that they ſeldom let their ovens cool ſufficiently; by which means the flax is conſiderably injured, and part of it is totally ſpoilt. M. du Hamel, upon inquiry, found that the proper degree of heat at which the flax ſhould be put into the oven is, from fifty to fifty-five degrees of Reaumur's thermometer.

1. The uſual price of flax-ſeed is two pounds two ſhillings per coomb, and the quantity ſown is two buſhels per acre.

2. As to manure, there is none laid upon land where flax is to be ſown; but it muſt be clean or ſwerd land.

3. If the land be ſwerd land, or what is called graſs land, it muſt be plowed but once and harrowed fine. Rich land will bring turnips, wheat, or clover, &c. after the flax is off.

4. The crop, managing and getting into the barn, coſts about three pounds an acre. The produce is from twenty to fifty ſtone an acre, according to the land. It ſells at five pounds, ſix pounds, or ſeven pounds per ſcore.

5. It does not impoveriſh land, but rather improves it.*

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* Bath Soc. Tranſ. Vol. IV. p. 255.

SECTION IV.

Of WOAD.

THIS plant, which is the *Iſatis ſativa vel latifolia*, of C. Bauhin, p. 113, puts forth ſtems about three feet high, and of the thickneſs of a man's finger: theſe divide at their top into ſeveral branches loaded with leaves, irregularly placed; and theſe leaves are ſleek and of a blueiſh-green colour. The branches bear alſo great numbers of flowers, compoſed of four yellow petals diſpoſed croſs-wiſe: the pointal becomes a capſule flattened on the edges, and each capſule contains two oblong ſeeds: the root is large, woody, and penetrates deep into the ground. This plant delights in a warm climate; though experience has ſhown that it may be cultivated here with great ſucceſs.

A light, black, kindly, and rich ſoil, or a meadow newly broken up, is choſen for the culture of woad; but it muſt not by any means be ſown on ſtoney or ſhallow land. It thrives well in plains, but ſtill better on the ſouth ſide of a hill: the eſſential point is, that the ſoil be good;

and Mr. Miller is of opinion, that it ſhould not be too light or ſandy, nor too ſtiff or moiſt; but rather a gentle hazle loam, whoſe parts will eaſily ſeparate.

Mr. Bartley has informed us that he tried the culture of this plant on ſome part of Briſlington common, where it ſucceeded extremely well. The ſoil a rich loamy ſand, the colour that of a hazel-nut when fully ripe; the upper ſtratum of a pretty uniform quality, to the depth of from two feet and a half to four feet.*

Though the land which is intended for woad be never ſo good, it muſt be dunged a year before it is ſown with this plant. A crop of wheat may then be taken, after which the ground muſt be brought into the fineſt tilth by autumnal plowing, and ſummer fallowing in the beſt manner, as has been before directed.

In warm climates, woad is ſown as early as April or May; but in countries like ours, the beſt way is to give the laſt plowing towards the end of July or beginning of Auguſt, and lay it as ſmooth as poſſible. A good harrowing after this, will fit it completely to receive the ſeeds, which, if rain falls ſoon after their being ſown, or if they are ſteeped in water during the night be-

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[*] Bath Soc. Tranſ. Vol. IV. p. 273.

fore the ſowing, will appear in a fortnight, if the weather be favorable.

They ſhould be but ſlightly covered, and ſhould be ſown ſo thin, as that the plants may ſtand ſix inches aſunder. Some ſtrew pigeon's dung on the land juſt after having ſown it with woad, and the plants become much the finer for this manure.

It is a common cuſtom to ſow woad in broadcoaſt: but all plants which require being hoed, ſhould certainly be ſowed in rows, becauſe this method leſſens the labor and time of hoeing; and beſides, it is much eaſier, in this way, to give each plant its due diſtance.

When the woad is grown large enough to be diſtinguiſhed, it ſhould be carefully cleared of all weeds, for theſe would hurt it greatly; and at the ſame time the plants ſhould be thinned wherever they ſtand too cloſe: without this precaution, the woad would produce but very few leaves, and would remain extremely ſtunted in its growth

The intervals between the plants ſhould be ſtirred whenever the ſeaſon requires it; and in the doing of this, the weeds will not only be deſtroyed, but care ſhould alſo be taken to lay up ſome earth to the ſtems of the plants.

It is ſaid to be the practice in ſome countries, to flood their woad-grounds; but in order to reap benefit from this, the huſbandman ſhould be able to repeat it frequently; otherwiſe the heat of the ſun, after having exhaled the water, would harden the ſurface of the earth, and thereby greatly injure the plants.

Woad affords two crops in the ſame ſeaſon; the firſt is the beſt, and is therefore kept ſeparate from the ſecond, which would ſpoil it. The firſt is ſold for from twenty-five to thirty pounds a ton; but the latter will not bring more than ſeven or eight pounds, and ſometimes not ſo much. An acre of land well cultivated, will produce a ton of woad, and in good ſeaſons more. The firſt crop is gathered towards the end of Auguſt, and the laſt at the end of October or beginning of November, but this laſt crop muſt be got in before the firſt froſts come on; for after that the leaves would be good for nothing. When the plant is ripe, which is known by its firſt leaves beginning to dry, all the leaves are cut off by a man who graſps the plant in handfuls, and they are then laid in a heap to wither. Whilſt they are in this ſituation, they muſt be ſheltered from the ſun and rain, and muſt be frequently turned in order that they may heat equally: they are then carried to a mill, ſomewhat like that which is uſed for preſſing the oil out of lin-ſeed, and are there ground till they are reduced into a paſte, which is afterwards formed into cakes of about a pound weight; and theſe are laid to dry in a covered place, where neither the rain nor the ſun can come at them.

This paſte is dried thus for about a fortnight, till it has acquired conſiſtence enough to be formed into ſmall roundiſh lumps, by means of little wooden moulds, into which it is put for that purpoſe. As faſt as theſe lumps are taken out of the moulds, they are laid upon wicker hurdles looſely woven, ſo as not to touch one another, and in ſuch manner that the air may come at every part of them, as is practiſed in the drying of ſtarch. Theſe lumps become very hard, and in this condition it is that that they are ſold. When they are to be uſed, they muſt be ſteeped a long while in water before they can be broken.

The woad thus prepared yields an excellent blue dye, very laſting, and with which all the degrees of this colour may be made; and it is not long ſince this plant was preferred to indigo.

When it is intended to ſave the ſeeds of woad, a ſmall portion of the plantation ſhould be allotted for this purpoſe at the laſt cutting, and then a part only of the leaves there ſhould be taken from the plants: but it is proper to retrench ſome of them, becauſe experience has ſhewn that the plants on which all their leaves are left, run to ſeed too ſoon, and that their ſeeds in this caſe, have often been deſtroyed by the cold of the enſuing ſpring. Thus woad, being a biennial plant, ſhould not be ſuffered to ſeed before the month of Auguſt, in its ſecond year.

As this plant is reckoned to be a great impoveriſher of the ſoil, it is natural to conclude, that two crops of it ſucceſſively ought not to be taken.

SECTION V.

Of WELD, or DYER's WEED.

WELD is uſed by dyers to give a yellow colour to woollens, ſilks, cottons, and threads; and in conſequence of this, C. Bauhin calls it *Luteola herba, ſalicis folio,* p. 100. Linnæus claſſes it as a ſpecies of the reſeda, or baſtard-rocket. Its root, which is compoſed of a few ligneous fibres, does not pierce deep: from this root it puts forth leaves about four inches long, and half an inch broad, of a lively green, ſoft to the touch, and ſpread circularly near the ground, with ſome gentle wavings at their edges, not obtuſe at their points. Its ſtem which riſes from amid theſe leaves to the height of three feet, or even more if the ſoil and culture be very good, often branches out, and is garniſhed with leaves like thoſe below, though ſmaller in proportion as they approach the flowers, which grow in long looſe ſpikes at the end of the branches or ſtems.

Theſe flowers, which appear at the latter end of June, are each of them compoſed of three ſmall irregular petals of a greeniſh yellow, to which ſucceeds a globular berry of the ſame colour, terminated by three points, and in which are incloſed ſmall brown ſpherical ſeeds. Theſe ſeeds ripen in September. The plant becomes entirely yellow when it is dry, and the whole of it, but eſpecially the berry, is uſed in dying. The moſt ſlender weld, particularly if it inclines to a ruſſet colour, is accounted the beſt: that which is larger, and of a dull green, is much leſs eſteemed.

This plant grows naturally along the ſides of high-ways, upon dry banks, and on old walls in many parts of England, France, Spain, and other countries, where the winters are not ſevere: but the cultivated ſort is far preferable to the wild, both for the quantity and goodneſs of the colour which it yields. It will thrive tolerably on almoſt any ſoil, provided it be dry and warm: but the richer the land is upon which it is ſown, the greater will be the produce; and in proportion to the care with which it is cultivated, the more vigorous and fit for dying will it be.

The ground for this, as for every other plant, ſhould be in fine tilth at the time of ſowing it; though here, unleſs it be very poor indeed, it will not require dung. The ſeed ſhould be that of the preceding year; for if it be older, great part of it will not grow. It is a bad cuſtom to ſow weld broad-caſt, or along with any grain: but if it be ſown broad-caſt, the plants ſhould be ſet out with the hoe at ſix inches diſtance at leaſt. It is however far better to ſow it in drills; as is the caſe with all plants that require hoeing. It will only want to be buſh-harrowed; for it ſhould not be covered deep. A gallon of ſeed ſowed in the broad-caſt way is enough for an acre. It will not grow much the firſt ſummer, when thus ſown; but it will grow apace after the corn is off.

The beginning or middle of Auguſt is a proper ſeaſon for ſowing weld in this country. The only care it requires while growing, is to keep it clear of weeds which might choak it, or at leaſt weaken its growth.

Mr. Miller is of opinion, that the beſt time to pull the weld for uſe is, when it begins to flower, that is to ſay, about the latter end of June; becauſe, like all other vegetables, it is then in its greateſt vigour, and conſequently beſt fitted to yield the greateſt quantity of dye. For a produce of new ſeeds, the beſt way is to ſow a ſmall piece of land on purpoſe, or to ſet apart for this end, a ſuitable portion of the field, rather than let the whole ſtand too long; by which means the uſeful plants would be injured in their quality, far beyond the value of the ſeeds got from them; the berries being, as was before obſerved, the part which yields the fineſt dye: beſides, the ſeeds obtained from the whole field prematurely pulled, would be a mixture of ripe and unripe ſeeds, not to be relied on. The common way of drying theſe plants, is to ſet them upright in ſmall handfuls in the field, and when they are dry, to tie them up in bundles. They muſt be houſed dry, and care muſt be taken to ſtack them looſely, that there may be room for the air to paſs between; to prevent their fermenting.

The plants intended for ſeed ſhould be pulled as ſoon as their ſeeds are ripe, and then be dried and beaten out for uſe; for if this be deferred, or if they are let ſtand too long, the ſeeds will ſcatter.

The method of cultivating this plant at Oiſſel, in Normandy, where great quantities of it are raiſed, is as follows:

In the month of July, juſt after the kidney-beans then in bloom have been hoed for the ſecond time, and earthed up, eſpecially if there be any appearance of rain, weld is ſown among them, very thin, and as equally as poſſible. This ſeed is buried by dragging over it a ſmall buſh of thorns. Whilſt the weld riſes, the beans ripen and are gathered; after which the former occupies the ground entirely. This is hoed about Michaelmas, then left in that condition during winter, and in the enſuing month of March, when the danger of froſts is over, it is hoed again, to extirpate ſuch weeds as may have ſince come up. Towards the end of June in this ſecond year, when the weld has done bloſſoming, when its berries form, and when the plant begins to turn yellow, advantage is taken of the firſt fair day after rain, to pull it up. Two men will then do as much work in a day, as four can do when the ground is hard and dry. It is carried off in large bundles: but theſe are untied before the weld is laid up for keeping, and the plants are ſpread out and ſet upright againſt walls or hedges expoſed to the ſun, the heat of which dries them completely in two days. They are then laid upon a cloth, to prevent the loſs of the ſeed, which drops eaſily out of the now open capſules; and finally, after being tied up again in bundles, weighing about thirty pounds apiece, they are piled up looſely in a barn, or other well covered place, where they complete their ripening, and generally ſhrink to leſs than half their former weight.

Weld raiſed on rich ground is apt to be greaſy, and too full of ſtalks: that which grows in ſandy places is of a better quality, and has only one main ſtem: but, in return, the produce here is much leſs than in the former caſe.

As ſoon as the weld has been pulled, ſheep are turned in upon the land, to eat up the graſs it may have produced: it is then plowed once, and after another plowing at the end of October, it is ſowed with wheat or rye, without uſing either compoſt, or dung. If the land is light, and deſtined for ſpring corn, turnips may be ſown upon the firſt plowing after the weld; for there will be time enough for this crop, before the neceſſary plowings for a ſpring crop.

Weld may be ſown with peas, in alternate rows, and managed preciſely in the ſame way as with kidney beans.

Mr. Young informs us, that Mr. Arbuthnot ſowed weld on two acres of land that was thinly planted with madder. The weld was pulled in the month of July, in the ſecond year, and yielded on both acres a produce worth ſeventy-two pounds, that was ſix loads, at twelve pounds per load; which was the price that year. It is true, the madder was not ſo good on the land where the weld grew; but both crops together yielded him a clear profit of thirty pounds, four ſhillings, and two pence per acre*.

SECTION VI.

Of LAVENDER.

NARROW-LEAVED Lavender is the common ſort, and is ſo well known as to require no farther deſcription. It flowers in July, at which time its ſpikes are gathered for uſe: there is a variety of this, with white flowers.

This plant is propagated by cuttings, or ſlips; the beſt ſeaſon for which is in March, when they ſhould be planted in a ſhady ſituation, or at leaſt they ſhould be ſhaded with mats until they take root, after which they may be expoſed to the ſun; and when they have obtained ſtrength, may be removed to the places where they are deſigned to remain. Theſe plants will abide much longer in a dry, gravelly, or ſtony ſoil, in which they will endure our ſevereſt winters; though they will grow much faſter in the ſummer, if they are planted upon a rich, light, moiſt ſoil, but then they are generally deſtroyed in winter; nor are the plants half ſo ſtrong ſcented, or fit for medicinal uſes, as thoſe which grow on the moſt barren, rocky ſoil.

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* Farmer's Eaſtern Tour, Vol. II. p. 282.

Lavender may be cultivated to advantage on a few acres of land that are ſuitable to it, and at no great diſtance from a capital town, where there is always a demand for it, by the druggiſts, chemiſts, perfumers, ſoap-boilers, &c.

The gardeners about London, who are generally great œconomiſts of their land, plant out their lavender at firſt in cloſe rows, and when it grows buſhy, ſo as to fill the alleys, they then take out every other row, repeating this as often as it may be required from the increaſe of the plants.

They gather from an acre of land annually about four hundred dozen of bunches, of the ſize of a man's grip; which they ſell at an average for one ſhilling and ſixpence per dozen, or thirty pounds per acre; but from this the expence of culture and rent of land muſt be deducted, which are no doubt very conſiderable. But, if we calculate theſe and all other charges roundly, at ten pounds per acre, which is ſurely an ample allowance, ſtill there remains a very handſome profit to the ſkilful cultivator.

This plant requires no manure.

SECTION VII.

Of MUSTARD.

THERE are three ſorts of this plant cultivated by our gardeners, &c. the firſt of which is the common white muſtard, and is generally raiſed as a ſallad herb for winter and ſpring uſe.

Another ſort is the common muſtard, which is frequently found growing naturally in many parts of England, but is alſo cultivated in fields for the ſeed, of which the ſauce called muſtard is made. This riſes with a branching ſtalk four or five feet high; the lower leaves are large, rough, and very like thoſe of turnips; the upper leaves are ſmaller and leſs jagged. The flowers are ſmall, yellow, and grow in ſpiked cluſters at the end of the branches; they have four petals placed in form of a croſs, theſe are ſucceeded by ſmooth pods, ending with four corners.

ners. It flowers in June, and the ſeeds ripen in Auguſt.

The third ſort grows naturally on arable land in many parts of England. The ſeed of this is commonly ſold under the title of Durham muſtard-ſeed; of this there are two varieties, if not diſtinct ſpecies; one with cut, and the other with entire leaves. The ſtalks riſe about two feet high, the leaves are rough, and in one they are jagged like turnip leaves, and in the other are oblong and intire. The flowers are yellow, the pods are turgid, angular, and have long beaks. Theſe flower in April and May, and the ſeeds ripen in June.

There is a good deal of muſtard cultivated in Eſſex, eſpecially about Coggeſhall and Kelvedon: it requires a rather heavy ſoil, which muſt be brought inro fine tilth. One buſhel per acre is ſown in March, broad-caſt, and the plants are ſet out at about ten inches diſtance, and are hoed always twice, and frequently three times. The medium crop is three quarters an acre; and the medium price is ten ſhillings per buſhel: this makes the crop worth about twelve pounds an acre. I have however been aſſured, that four, and even five quarters are not uncommon; and am convinced, that if the horſe-hoe was adopted in the culture of this plant, the produce would ſeldom or never fall ſhort of that quantity: for nothing improves the feeding of plants half ſo much as the proper uſe of that implement, which brings an aid at the very time when it is moſt wanted.

ESSAY X.

Of the Culture of Artificial Graſſes.

SECTION I.

Of LUCERNE.

EIGHT ſpecies of this plant are diſtinguiſhed by Mr. Miller: but J. Bauhin's *Medica major, erectior, floribus purpuraſcentibus,* greater upright medic, with purpliſh flowers, is that which is cultivated for the food of cattle, and in all probability the Medica of Virgil, Columella, Palladius, and other ancient writers on huſbandry. It has a perennial root, and an annual ſtalk, which riſes full three feet high in good land, and is garniſhed at each joint with trifoliate leaves, whoſe tubes are ſpear ſhaped, about an inch and a half long, and half an inch broad, ſawed towards their ſtalks. The flowers grow in ſpikes, which are from two, to near three inches in length, ſtanding upon naked foot ſtalks, two inches long, riſing from the wings of the ſtalks: they are of the pea bloom, or butterfly kind; of a fine purple colour, and are ſucceeded by compreſſed moon-ſhaped pods, which contain ſeveral kidney-ſhaped ſeeds. It flowers in June, and its ſeeds ripen in September.

There are different varieties of this ſpecies, *viz.* one with violet coloured flowers; another, with yellow flowers; a third, with yellow and violet flowers mixed; and a fourth with variegated flowers: but none are ſo ſtrong or good as that with purple flowers.

Columella calls this the choiceſt of all fodder, becauſe it will laſt ten years, and will bear being cut down four, and in ſome ſeaſons ſix times in the year;* becauſe it enriches the land on which it grows, fattens the cattle fed with it, is a cure for ſickly cattle; and becauſe a jugerum (about three quarters of an acre) of it is abundantly ſufficient to feed three horſes through the whole year.

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* We ſhall find that it will laſt much longer: Pliny, indeed, ſays thirty years. This, however, it will not do in our climate, nor will it cut ſix times in a ſeaſon as in Italy.

This plant is ſuppoſed to have taken its name Medica, from Media, of which country it is ſaid, to be a native, and that Darius Hyſtaſpes carried great quantities of it from thence, as provender for his horſes, when he invaded Greece; by which means its ſeeds became ſcattered there. Whether the Romans firſt had it from that country, or from Media, I will not pretend to ſay; but certain it is, they held it in very great eſteem.

Yet, notwithſtanding it was in ſuch high repute with the ancients, and has been cultivated to great advantage for many years, both in France and Switzerland, it was not till very lately that it has been much in vogue here, although it ſucceeds as well in this country, as in either of the laſt mentioned; being extremely hardy, and reſiſting the ſevereſt cold of our climate.

As I cannot too much recommend the culture of this admirable plant, I will here give ſuch practical information, as I hope will tend to promote it; and for this purpoſe I will firſt lay before my reader, that authentic account which I find given by Mr. Arbuthnot, as related by Mr. Young, in his Eaſtern Tour.*

In the year 1759, twelve acres of a black, deep, ſandy loam were ſown with barley, after turnips, and with it ten pounds per acre of lucerne, broad-caſt. The corn was mown and carried; but nothing done to the lucerne.

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* Vol. II. p. 257.

In 1760, it was mown for ſoiling horſes, &c. but the produce was weak, and not conſiderable enough for a particular valuation.

In 1761, the crop came to perfection. Early in the ſpring, it was croſs plowed with a round ſhare, and harrowed. Mowed it thrice, each time for hay; the product of the three crops was four tons per acre of the beſt hay ever uſed. The team-men would not at firſt uſe it; but they were at laſt ſo prejudiced in its favor, that when done, they lamented the loſs.

After the mowing there was an aftermath, which yielded ſome food for cows and ſheep. Between each cutting it was harrowed: and likewiſe in Autumn. The average price of common hay is forty-five ſhillings a load; but Mr. Arbuthnot valued this at fifty-five ſhillings; in which valuation his men agreed.

In 1762, The culture was the ſame as the preceding, and alſo the crop; it was again mown thrice.

In 1763, The ſame culture and product: a lattermath at the end of September was cut off in one nightby a ſlight froſt: for, hardy as the plant in general is, yet the ſhoots are extremely tender; they will bear no froſt. The natural graſs made ſo formidable an appearance, that the autumnal harrowing was omitted; from an idea that it would be ineffectual.

In 1764, One acre was plowed up in the ſpring, and planted with madder; the eleven remaining were mown twice, but had no harrowing: the product forty-four tons of dry hay; but more than half was in the firſt crop, and much of it natural graſs.

In 1765, Plowed the whole up in the ſpring, for madder: the lucerne declined, owing, as apprehended, to a want of more regular and ſevere harrowing; as it has been found, that the ſevereſt operation of that ſort will not damage the plants. Rocque's harrow was uſed.

With reſpect to making it into hay; the lucerne is ſo ſtalky, that it does not ſettle ſoon; it was therefore ſtacked very green. The heat that reſults from ſap (not wet) is beneficial. It was always cut as ſoon as there appeared a general ſcattered bloom.

Expences and produce.

1760. Rent	£ 1	0	0
Tythe and town charges	0	6	0
Carry over	£ 1	6	0

Three

Brought over £	1	6	0
Three plowings	0	13	6
Seed and ſowing	0	12	0
Three harrowings	0	4	6
Mowing, &c.	0	5	0
By green food	1	0	0
Loſs £	2	1	0
1761. Rent, &c. £	1	6	0
Plowing	0	4	6
Four harrowings	0	6	0
Mowing thrice, (three ſhillings, one ſhilling and ſix-pence, and one ſhilling and ſix-pence)	0	6	0
Making, raking, carting, and ſtacking	1	0	0
£	3	2	6
By four loads of hay, at fifty-five ſhillings	11	0	0
By after-graſs	0	5	0
	11	5	0
Deduct expences	3	2	6
Clear profit £	8	2	6
1762. Expences and product, the ſame as in 1761 £	8	2	6

1763

1763. By four loads of hay, at fifty-five ſhillings	£ 11	0	0
Expences this year	2	16	6
Clear profit £	8	3	6
1764. By four loads of hay	11	0	0
Expences this year	2	5	6
Clear profit £	8	14	6
The above four years profit collected, is	£ 33	3	0
Deduct firſt year's loſs	2	1	0
Profit in five years £	31	2	0

Which is ſix pounds four ſhillings and four pence per annum, and on twelve acres, ſeventy-four pounds twelve ſhillings.

This proves the great profit of lucerne: and had it been cultivated in drills, inſtead of being ſowed broad-caſt, it might have continued from fifteen to twenty years in the ground, in an equal ſtate of perfection and of produce. It is true, there are ſome objections to the drill culture of this graſs: ſuch for inſtance, as its not covering the ground ſo as to have a proper ſwerd or bed, for the making it into hay when cut: again, this operation preventing for a time the growth of the plants, which would otherwiſe vegetate rapidly: but this laſt objection, equally affects the broad-caſt and the drill-ſowed lucerne; and I am of opinion both difficulties may be removed by a ſimple contrivance.

Every farmer has a ſtock of hurdles by him, not much in uſe at this ſeaſon of the year: let him fix them up in rows between the ſwarths of lucerne, ſo as to make one row to every two ſwarths. Inſtead then of beginning to move and turn theſe ſwarths upon the bare ground, and the tops of the growing plants; let the farmer employ his hay-makers, men, women, and children, to take up the ſwarths in heaps with both hands, and hang them well poiſed over the hurdles, where they will be expoſed to the ſun and air, and free from the damp of the ground, and will conſequently be more made in one day in this ſituation, than in three, while on the ground. But this is not the only advantage attending this mode of management: for in this way, the hay will be ſo little moved and toſſed and tumbled, that neither the leaves nor flowers, which are the moſt precious parts of the plant, will be diſturbed or ſhaken off; and the ſavings of thoſe, and of the labor of frequent turning, &c. I am convinced would fully compenſate the expence of hurdling and hanging up the graſs: particularly if it be conſidered, that in this way there can be no mixture of earth or dirt to daub and foul the hay. This circumſtance is the reaſon why Mr. Arbuthnot has recommended the broad-caſt culture of this plant, in preference to the drill-ſowing: but if this objection were obviated, he clearly and decidedly recommends the drilling in rows eighteen inches aſunder: and at all events prefers this method when the lucerne is to be cut for ſoiling of horſes; it not being, in this caſe, ſubject to the inconvenience of wet and dirt, &c.

I can ſee no objection to this hurdle plan, but its being expoſed to high winds, which might throw it off. This may happen: but it muſt be carefully replaced, when the wind falls; and this may ſtill be executed at leſs expence than the conſtant labor of tumbling it about. Where this graſs, or indeed any other, is reſerved for ſeed, I am ſure this is infinitely the beſt way of proceeding, to have it in good condition.

If lucerne be drill-ſowed, Mr. Cooke's new invented hoe is, for it, an admirable and œconomical contrivance, and will keep it in excellent condition with little trouble, compared to any other method; for that hoe will clear all the alleys of their weeds better than any ſhim, and at the ſame time will ſtir the ground to a proper depth. This hoeing ſhould be repeated after every cutting of the graſs.

But if the broad-caſt method ſhould ſtill be preferred by ſome farmers, they will find it abſolutely neceſſary to harrow and croſs harrow it both in ſpring and autumn, till the land has altogether the appearance of a fallow; and alſo to manure it every autumn, before the harrowing, with fine rotten compoſt.

The ſpring harrowing ſhould be done as early as the ſeaſon will admit; but if even the young ſhoots are begun to ſpring, ſtill it muſt be harrowed, for they had better be totally deſtroyed, than omit an operation ſo eſſential to the goodneſs of the crop.

In order to aſcertain in what degree lucerne would bear rough treatment, Mr. Arbuthnot wounded many plants ſeverely, and even mangled them. Others he cut off three inches below the ground: theſe laſt were abſolutely killed; but the former were not apparently hurt. This fact proves, that the butt or crown may be wounded in any degree; for if the leaſt bit remains, it ſprouts preſently: but if quite cut off, the plant is deſtroyed.

I ſhall next lay before my reader an account of the culture of lucerne given to the Society of

Arts in London, by Mr. Pratt of Purfleet, in Eſſex.*

The field where the lucerne was cultivated, was a good hazle loam, neither too light nor too ſtiff, the ſoil about three feet deep, with a chalky bottom, the land inclining to the north-eaſt: ſome part of the ſame field was ſtiffer, inclining to a clay; but not ſure whether any chalk lay under this part, though the plants ſhowed no difference from the difference of ſoil.

The field in 1773, had borne turnips properly hoed and fed off with ſheep; and on April 13th, 1774, after the land had had two plowings and harrowings, the ground being fine, he began to ſow in drills twenty inches aſunder, and uſed about ſix pounds of ſeed per acre.

In May and June the fly made great havock, ſo that at different times the ſowing and hoeing were repeated until the 5th of July, when the rows were complete, and thoſe parts that were not damaged by the fly, were in a thriving ſtate: on the 30th of July began to cut, and by the 20th of September, it had been cut all over once. The latter end of October, ten loads of rotten dung were laid on each acre, and, the earth was turned each way out of the alleys, and laid over the plants, with a ſmall plough; ſo that the land appeared like a fallow.

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* Lond. Soc. Tranſ. Vol. I. p. 164.

1775. In this ſtate it lay until the 20th of February this year, when it was buſh-harrowed croſs ways, to lay the ridges down into the alleys.

In April, mended ſome trifling places, and in May 27th began to cut; it being then about twenty inches high.

June the 30th, began to cut the ſecond time, and followed this cutting with a horſe-hoeing in the alleys, and a hand-weeding in the rows.

Auguſt 7th, began to cut the third time.

September 26th, began to cut the fourth time.

November 6th, dunged and plowed as laſt year.

1776. The weather being wet, could not buſh-harrow until the 12th of March, and on the 27th, as the plants grew faſt, gave it a perfect hand-weeding in the rows. Began cutting in May, and during this ſummer cut four crops, horſe-hoeing the alleys each time of cutting; hand-weeded again in September, and in November dunged and plowed the alleys as laſt year.

In May this year, Mr. Pratt ſowed two acres more, adjoining to the above, which had borne cabbages the preceding winter, and were taken off before Chriſtmas, and the land then plowed and prepared for ſowing.

The plants came up well, and no accident happened from the fly: cut this ſowing once this year, and cultivated it like the other lucerne.

The produce of theſe four acres maintained ten horſes twenty-eight weeks, or ſeven months, and fifteen head of cattle eighteen days.

The land which bore the cabbages was preferable to that which bore turnips; being much cleaner. May is a proper month for ſowing; hand-hoeing and weeding are requiſite the firſt year, as the plants are too tender for the horſe-hoe. Cutting once only the firſt year, gives the roots time to ſhoot down, and gather ſtrength.

Horſe-hoeing the alleys after every cutting, and hand-weeding the rows in March or April, are neceſſary: but before it is laid up for the winter, ſhould not on any account be omitted. After the laſt cutting and weeding, let ten or twelve loads of rotten dung be laid on each acre, and gathered up with a ſmall plough, to form the ridges over the crowns of the roots: nothing more is neceſſary until the firſt dry day in February; then buſh-harrow the ridges down into the alleys.

In the third year, the plants ſeem to arrive at their perfection, and do not appear to improve or diminiſh after that time: neither does dry or wet weather materially affect their growth; as Mr. Pratt frequently obſerved by tying a ſilk thread round ſome plants. It grows about an inch a day, or ſomewhat leſs if the weather be cold.

This graſs has the effect of ſalt-marſhes; it purges and is diuretick for three or four days, and then fattens horſes at a great rate, although hardly half the allowance of corn is given.

Sheep ſhould not be permitted to bait on it; as they will ſcoop the crowns of the roots, and deſtroy thoſe buds that are formed round the crowns for the ſucceeding crop: but that is not the caſe with horned cattle.

It is obſervable, that Mr Arbuthnot's direction is quite the reverſe, in this reſpect; for he recommends the aftermath as excellent feed for ſheep.

We have now ſeen the methods of ſowing lucerne broad-caſt and in drills: but there remains yet another way of cultivating this graſs, by tranſplanting; which I have practiſed with ſucceſs, and think it is attended with ſome advantages over either of the former ways: for in this caſe, when a field is planted out from the ſeed-bed, it is ſooner productive, and is free from the devaſtations of inſects: but, beſides this, it is attended with what I reckon a ſtill greater advantage, which is, the cutting of the tap-root and making it branch out laterally; which in ſhallow ſoils is of real benefit.

I was much flattered when I found my ſyſtem was agreeable to that of M. de Chateauvieux, who explains it in this manner. Lucerne grows naturally with one large perpendicular or tap-root, which penetrates very deep into the earth, and has few, if any, lateral roots. From ſimilar experiments on other tap-rooted plants, he was induced to think, that lucerne, by tranſplanting it, and at the ſame time cutting off part of its tap-root, might be made to ſhoot out horizontal roots, which, reaching into the looſe mould of the alleys, and extending themſelves there, would collect a greater quantity of nouriſhment for the plant, and conſequently enable it to produce more abundantly.

M. de Chateauvieux's experience juſtified this idea in its fulleſt extent, and the horizontal roots puſhing out, were again cut off by the horſe-hoeings of the alleys, which made them branch out afreſh, and thus multiplied the roots and fibres amazingly. His rules for tranſplanting are to this effect.

1. The beds or lands ſhould be laid up pretty round, and as the lucerne is to remain many years on the ground, no pains ſhould be ſpared in preparing the earth.

2. Lucerne ſhould be ſown in the ſpring, and in a rich mould, that the plants may be ſtrong enough to tranſplant in September.

3. Plants two or three years old my be tranſplanted; as well as young ones.

4. They ſhould be tranſplanted in Auguſt or September, that they may have time to take freſh root before winter comes on.

5. The mould into which they are tranſplanted ſhould be moiſt; and if the weather be ſomewhat rainy it is the better. In this caſe, watering the plants is quite unneceſſary.

6. If the autumn be very dry, it is better to ſtay till the following ſpring; and if the plants are moved in April, they will ſurely take root and do well.

7. If they can be tranſplanted in autumn, they will yield pretty good crops the next year: but if they are not moved till ſpring, the crop that year will be but indifferent.

8. The plants from the nurſery muſt be taken up with care. The roots ſhould be left ſix or ſeven inches long, and the green tops cut off within two inches of the crown.

9. The plants will take root ſooner, if put into water when taken up, and kept there till planted.

10. They may be planted with a dibble; but a better way is to open a ſtraight furrow five or ſix inches deep, and placing the plants therein, cover them up to the neck.

11. Great care ſhould be taken not to ſuffer any weeds to grow among the lucerne. To this end, the rows ſhould be weeded by hand, where the horſe-hoe cannot go.

12. The alleys may be ſtirred with the plough, as repeatedly directed for other plants. Or Mr. Cooke's horſe-hoe may be uſed, as I have before mentioned.

13. This hoeing ſhould be repeated after every cutting, and the plants earthed up in winter as Mr. Pratt directs.

14. As ſoon as ſome of the plants begin to bloſſom, the lucerne ſhould be cut. It will then make excellent fodder, ſuperior to every other kind. It ſhould be dried as quick as poſſible, and frequently turned.

15. It muſt not be houſed till it is dry: but it is poſſible to over-dry it, and then the leaves will drop off, which ſhould be avoided.

16. Cattle muſt not have too much lucerne at once, till they are accuſtomed to it.

Theſe rules contain all that is eſſentially neceſſary for cultivating properly, this kind of artificial paſture; and ſainfoin may be managed exactly in the ſame manner.

M. de Chateauvieux informs us, that he had upwards of ſix loads on an Engliſh acre in one year, by this mode of culture, which is two loads more than Mr. Arbuthnot's produce; and at his price of fifty-five ſhillings per load, would make the annual value of the crop amount to ſixteen pounds ten ſhillings: and ſuppoſing the culture and harveſting in the drill way to amount to ſix pounds ten ſhillings, which is double what Mr. Arbuthnot calculates, ſtill the neat profit would be ten pounds on this crop; which is immenſe. Mr. Rocque, who cultivated this plant at Walham-Green, has ſeen it mowed five times a year, when it produced eight loads of hay per acre, which goes yet beyond M. de Chateauvieux, and makes it the moſt profitable crop that can be cultivated; particularly when we conſider how far ſuperior this graſs is to every other fodder for the feeding of cattle; as I ſhall have occaſion to ſtate preſently.

In the year 1781, a gentleman farmer of this county made an experiment upon the culture of lucerne, by dividing a field of eight acres into four parts, which he ſowed in the following manner.

Firſt part in drills, three feet aſunder.

Second part in drills, two feet aſunder.

Third part in drills, one foot aſunder.

Fourth part, broad-caſt.

The ſoil was equal throughout the field. The ſeed was ſown the 24th of April; on the 16th of

Auguſt the whole field was cut, and the produce of each part weighed ſeparately.

That ſown in three feet drills produced only about half the weight of that ſown broad-caſt, and the reſt in proportion, leſſening as the width of the rows increaſed. This at firſt diſconcerted the gentleman, who had been made to believe he would have moſt from his three feet drills. He was however perſuaded, by an intelligent friend, to give the whole a fair trial for three years, which he did, and found that the ſecond year, the difference was greatly in favour of the three feet drills; and in the fourth year they had a very decided ſuperiority; for by this time the plants became much ſtronger, ſpread amazingly, and nearly filled up the ſpaces between them: the produce of one root being more than that of any ten in the broad-caſt; which, by ſtanding too cloſe, were impoveriſhed, and could not increaſe in bulk like the others.

In the fourth year, the produce of the three feet drills was more than double the broad-caſt, and admitting the horſe-hoe, were kept free from weeds and earthed up at a ſmall expence, compared to the others.

This gentleman adds, that tranſplanted lucerne produces very little the firſt year, but in the ſecond is generally as good as that of three years growth from the ſeed.

Weeds are the greateſt enemy to lucerne; and the eaſieſt and cheapeſt way to keep the crop clean is, by ſowing in drills ſufficiently wide to admit the horſe-hoe; which not only deſtroys them at the leaſt poſſible expence, but greatly promotes the growth of the plants by earthing them: and, he might have added, by cutting their roots, and making them puſh out freſh fibres.*

As a complete proof of this advantage, M. de Chateauvieux informs us, that having taken up ſome tranſplanted lucerne, where the tap-root was cut, he found ſeveral large roots had grown out laterally, which being again cut by the horſe-hoe, would no doubt ſend out freſh fibres, and tend greatly to ſtrengthen the plants.

He fed his horſes with lucerne in the ſummer when they do moſt work, and was ſenſible of the great advantage it had over other fodder. He ſays, that five or ſix pounds a day are ſufficient for a middle ſized horſe: but the quantity may be increaſed or diminiſhed, according as the horſes are nouriſhed by it.

M. de Chateauvieux obſerves, that old ſets may be tranſplanted as well as young roots, and with as good ſucceſs. He alſo ſays, that he did not manure his lucerne, but truſted altogether to his horſe-hoe for culture. In this I think he was wrong: for I would certainly recommend a proper dreſſing every ſecond or third year.

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* Bath Soc. Tranſ. Vol. II. p. 104.

M. du Hamel informs us, that if lucerne be much wet in the field after it has been mowed, its leaves will turn as white as paper in a few days; but if it is only a flying ſhower, which has penetrated no farther than the ſurface, the beſt way is not to touch the ſwarths till the wind has dried them. In very hot weather, this hay muſt be houſed before it is quite dry; or the greateſt part of its leaves will fall off. He is of opinion, that it cannot be kept long in ſtacks in the open air, unleſs thoſe ſtacks be very well thatched, ſo as to turn off all wet: he alſo recommends a chimney to let off the moiſt and ſtagnant air; as we practiſe with our meadow hay, and clover, &c.

But he thinks it a ſtill preferable way to houſe this hay, and if this is done when it is ſtill a little damp, he recommends putting it alternately with layers of ſtraw. The ſtraw, thus placed, prevents the lucerne from heating, and contracts a fine ſweet ſmell, ſo pleaſing to horſes, that they eat it with appetite when given to them in the winter, mixed with the lucerne.

M. du Hamel aſſures us from his own experience,

rience, that this fodder cut before it had bloſſomed, and given green, had reſtored young horſes which had fallen away and loſt their fleſh, when no cauſe could be aſſigned for their decay; and that cows fed with it yield an extraordinary quantity of excellent milk. He holds it to be admirable food for every kind of cattle, horſes, oxen, cows, and ſheep, all of which are fond of it either green or dry.

Its only fault, ſays he, is, that it is too nouriſhing when dry, and that cattle, if let alone, will eat of it till they ſwell, or are hoved. But this is eaſily prevented by ſtinting them to a proper allowance, with which they will fatten and grow ſtrong.

M. du Hamel has farther remarked, that in ſome years ſwarms of black caterpillars are apt to breed in lucerne, and to eat up all its young ſhoots: to prevent which miſchief, he adviſes to cut it down as ſoon as theſe enemies begin to appear; for they will be thus deſtroyed, and the plants will ſoon ſhoot out anew, generally without any damage to the enſuing crop.

Mr. Baker, of the Dublin Society, whoſe accuracy may be depended upon, has given us ſome very intereſting, experimental trials reſpecting the value of lucerne compared to that of turnips and cabbages: which are as follow.

A fattening bullock of four cwt. will conſume every day

Of turnips 2 cwt. or $\frac{1}{2}$ his beef weight and ſome hay.

Of cabbages $1\frac{1}{2}$ cwt. or $\frac{3}{8}$ of ditto, and ditto.

Of lucerne $\frac{3}{4}$ cwt. or $\frac{3}{16}$ of ditto, and no hay.

A bullock may be ſuppoſed to be well fattened on turnips, cabbages, or lucerne, in twenty weeks, thus.

Of turnips, at 2 cwt. a day (beſides $8\frac{1}{2}$ cwt. of hay) 14 tons.

Of cabbages $1\frac{1}{2}$ cwt. a day (and $8\frac{1}{2}$ of ditto) 10 tons 10 cwt.

Of lucerne at $\frac{3}{4}$ cwt. a day (no hay neceſſary) 5 tons 5 cwt.

An acre of each of theſe will fatten,

Turnips, at 25 tons, will fatten (with hay) near 2 ſuch bullocks.

Cabbages, at 30 tons, will fatten (with hay) near 3 ditto.

Lucerne, at 25 tons, will fatten (without hay) near 5 ditto:

All which plainly ſhew the ſuperiority of lucerne to the other two plants, either by weight or by the acre.

As far as my own experience goes, which has only been on a ſmall ſcale, I ſhould be inclined to recommend the culture of lucerne by tranſplanting,

ing, rather than by ſeeds: it is both the quickeſt and the moſt certain, as being moſt ſecure from inſect foes. Nothing can exceed the excellence of this hay for cutting into chaff; it goes a great way to ſave corn, and if cut along with the ſtraw, with which it has been houſed as above mentioned, it will much improve the ſtraw for this very uſeful purpoſe.

SECTION II.

Of SAINFOIN.

THE French call this plant ſainfoin; which ſignifies wholeſome hay; becauſe it agrees remarkably well with all ſorts of cattle. As we owe to the French our firſt knowledge of this graſs, we have adopted their name for it; but its botanical appellation is *Onobrychis.*

If ſainfoin is cultivated in drills and horſe-hoed, its ſtalks will grow five feet long; and according to Mr. Tull, one acre of it will yield as much graſs, as thirty or forty acres of common paſture.*

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*Horſe-hoeing Huſbandry, chap. 12.

This great productiveneſs of ſainfoin, is owing to the vaſt quantity of its roots. Its tap-root penetrates ſometimes to fifteen or twenty feet deep, and ſends forth many lateral branches, which extend a great way, eſpecially towards the ſurface of a good ſoil.

It is wrong to think, as many do, that ſainfoin will not ſucceed, if there is not, at a certain depth, a bed of gravel, ſtone, or chalk, to ſtop the progreſs of its roots. On the contrary, the deeper the earth is, the more its roots extend, and the ſtronger and more flouriſhing is the plant.

As ſome of its ſeeds will not always grow, a ſmall quantity ſhould be firſt ſown to try it; as has been directed with regard to other plants.

Sainfoin ſhould not be ſown above half an inch deep; eſpecially in ſtiff lands: for the heads of its ſeeds are ſo large, and their necks ſo weak, that if they lie much deeper, they are not able to riſe through the incumbent mould.

As this plant yields but an inconſiderable produce the firſt year, the farmer, in order to make the more of his land, often ſows it along with barley, oats, clover, &c. The barley and oats remaining but a ſhort time on the ground, do no great injury: but clover and other biennial plants hurt it much.

It frequently happens, in dry years, that no ſainfoin is ſeen when the barley or oats are mowed: but on examining nearly, white threads may generally be perceived, which ſhow that the ſainfoin has ſprouted, and that its leaves, then very ſmall, have been cut off by the ſcythe.

If the other ſeeds ſown with the ſainfoin come up thick, and grow apace; and eſpecially if they are lodged, the ſainfoin is generally choaked. But this never happens when it is ſown with the drill plough: for as it is then in rows by itſelf, it is in little danger of being overpowered by other plants; and ſowed thus in alternate rows, it might anſwer extremely well; for it would have air and ſun ſufficient, and not too much heat; and at the ſame time a ſeaſon would be ſaved in its growth.

When Mr. Tull began to cultivate ſainfoin with the horſe-hoe, he ſowed two gallons of ſeed to an acre; and almoſt all the ſeed of an acre or two of ground periſhed, from its being ſown too late. But he was agreeably ſurprized at the end of three years, to ſee ſome plants of this graſs of an extraordinary ſize diſperſed here and there. This part of the field yielded him double the quantity of graſs that the reſt did, where the ſeeds had not periſhed, and where the plants were infinitely too cloſe.

He concludes from thence, that it is moſt profitable to ſow ſainfoin thin, that the roots of one plant may not hurt thoſe of another: and he thinks that they deceive themſelves who ſow their ſainfoin very thick in hopes of reaping a more plentiful crop; becauſe by ſo doing, they reduce their ſainfoin to the condition it is in on the hills of Calabria, near Croto, where it grows naturally without any culture, but ſo low and ſtunted, that one would almoſt wonder what could induce any one to cultivate ſo unpromiſing a plant.

Mr. Tull draws theſe concluſions from his experiments.

1. When ſainfoin is ſown with a deſign to cultivate it with the horſe-hoe, the beſt way is to ſow it in two parrallel rows, eight inches diſtant from each other, and to make the alleys forty inches wide, ſo that from the middle of one furrow to the middle of another, will be four feet.

2. If ſainfoin be ſown with an intention only to hand-hoe it, the ſpace between the two rows ſhould be ſixteen inches, and the plants in the rows ſhould be at leaſt eight inches aſunder.

3. When ſainfoin is ſown without any deſign to hoe it, the beſt way is to drill the rows eight inches aſunder, with no greater quantity of ſeed, than when they are ſixteen inches diſtance: for each plant ought to have ſufficient ſpace around it, to extend its roots in, and draw its neceſſary

nouriſhment from, without hurting its neighbouring plants.

Sainfoin thrives beſt in a rich, dry, and light ſoil, eſpecially if there be a bed of lime-ſtone, chalk, or gravel, under a conſiderable depth of mould. In marſhy grounds, or in lands which retain water, the roots are chilled, and the plant ſoon periſhes. Though it is a ſtrong plant, the ground on which it is ſowed ought to be in very fine tilth: for as it ſhoots out a great number of roots the moment it ſprouts, the mould ought to be as looſe and the ſtaple as deep as poſſible. It may be ſown at any time: but if ſo late as autumn, the young plants will be in danger of being hurt by froſts: and if it be ſown in ſummer, the ſeed frequently remains long in the earth without ſprouting; or if it riſes, the drought uſually ſtunts the young plants. The ſpring is therefore the moſt proper ſeaſon for ſowing it, when there is no longer any danger of hard froſts.

By means of the drill plough, the ſeed of the ſainfoin is dropt into channels which this implement makes, and is at the ſame time covered with the proper depth of earth.

If ſainfoin be drill-ſowed, a diſtance of twenty inches or two feet between the rows is the leaſt that ſhould be given, and the ſeeds ſhould be diſtributed very thinly. The alleys may then be completely ſtirred and cleaned by Mr. Cooke's ſix ſhared horſe-hoe: but this will only be neceſſary once, or at moſt twice, in the year, to this plant: that is, in ſpring and autumn. Thus the expence will be but trifling, and the ſainfoin may laſt thirty years on the ſame ground, which by this frequent ſtirring, will be kept perfectly clean and in good heart.

Sainfoin deſerves the farmer's utmoſt attention, as one of the moſt profitable plants he can cultivate. It will do on almoſt any land; and though it ſucceeds beſt on ſuch as I have mentioned above, yet it will grow even on dry barren ſpots, where ſcarcely any other graſs can live; provided its roots be not chilled by a cold clay, or other ſubſtance which retains water: and it has this farther advantage, that it may be mowed at different degrees of ripeneſs, with nearly the ſame profit.

1. It may be mowed before it is in bloom, for it is then admirable food for horned cattle, and when cut thus early, it yields a ſecond crop, which makes ample amends for what was loſt, by not letting the firſt come to its full growth. This early cutting is likewiſe attended with another benefit, which is, that it purges cattle, in the beginning of the ſummer, and thereby frees them

from diſorders occaſioned by the winter's cold or dry food.

2. If the weather be rainy, the ſainfoin may be left ſtanding till it is in bloom; when it ſtill is excellent fodder for cows. But care muſt be taken in making it into hay, that the flowers do not drop off, as they are very apt to do: for cattle are ſo fond of theſe flowers, that they often induce them to eat the reſt of the plant.

3. If the rain continues, the ſainfoin may be left ſtanding till ſome of its ſeeds are formed, and the crop will then be more plentiful; not only becauſe it will have attained its full growth, but likewiſe becauſe its leaves, being more ſubſtantial, diminiſh leſs in drying. It is not indeed then quite ſo ſweet as before; but horſes eat it readily, becauſe they love to feel between their teeth the ſeeds which now begin to be formed.

Mr. Tull ſays, this fodder is ſo excellent, that horſes need no oats when they are fed with it. He affirms, that he kept a team of horſes with it a whole year in good plight, without giving them any oats, though they were worked hard all the time. He adds, that he fattened ſheep with it, in leſs time than others that were fed with corn. But the hay of this plant can never be ſo good as when it is cultivated with the horſe-hoe: for in the common broad-caſt culture, it bloſſoms almoſt as ſoon as it is out of the ground.

If the ſeaſon continues rainy, it may be more adviſeable to let the ſainfoin remain ſtanding, than to run the hazard of having it rot on the ground; for then the ſeed will ripen and nearly make up for the loſs of the fodder: not only becauſe it will fetch a good price, but alſo becauſe two buſhels of it will go as far in feeding of horſes, as three buſhels of oats; and cattle in general, as well as poultry, are extremely fond of it.

The firſt of theſe ſorts of ſainfoin hay, cut before the bloom, is Mr. Tull's virgin hay, which, he ſays, is the beſt beyond compariſon, and has not its equal in the world, except lucerne. He gives the next place to the ſecond ſort, cut whilſt in bloom; and ſays, that an acre of land, well cultivated, may yield three tons of this bloſſomed hay: and he eſteems the third ſort, which he calls the full grown, many degrees inferior to either of the former; though it yields a greater crop, becauſe it has grown to its full bulk, and ſhrinks but little in drying. Even the ſainfoin haulm, after having yielded its ſeed, will make extremely good winter food for horſes and large cattle, when other fodder is ſcarce, and is reckoned better than the coarſe hay of flowed meadows, or any kind of ſtraw.

M. du Hamel has favored us with the following directions for making ſainfoin hay.

In a day or two after the ſainfoin has been mowed, it will be dry on the upper ſide, if the weather be good. The ſwarths ſhould then be turned; not ſingly, but two and two together: for by thus turning them in pairs, double the ſpace of ground is left betwixt pair and pair, and this needs but one raking; whereas, if the ſwarths are turned ſingly, that is, all the ſame way, the ground would require as much raking again.

As ſoon as both ſides of the ſwarths are a little dry, they ſhould be made up into ſmall cocks, the ſame day they are turned if poſſible: for when the ſainfoin is in cock, a leſs part will be expoſed to the injuries of the weather. The wet and ſun by turns, would exhauſt almoſt all its juices in ſix or eight days.

Theſe little cocks of ſainfoin may be ſafely made into large ones, without waiting for their being ſo thoroughly dry as thoſe of common hay ought to be: becauſe common hay, by ſinking down cloſer, excludes the air neceſſary for keeping it ſweet; ſo that if the weather prevents its being frequently ſtirred and opened, it will heat, turn yellow, and be ſpoilt; whereas ſainfoin, by admitting the air more freely, from its ſtalks being leſs flexible, will remain much longer without any danger of heating.

Sainfoin hay is never better than when it has been dried by the wind only, without the aſſiſtance of the ſun. A little rain, or a miſt, which will turn common hay, clover, and even lucerne, black; will do no hurt to ſainfoin, which is not really ſpoilt, till it rots upon the field.

If the weather threatens rain, and the ſainfoin is not yet dry, it may be laid in cocks, without fear of its heating, provided a buſhy faggot be ſet up in the middle of each cock, where it will ſerve for a chimney or vent-hole, through which the moiſture of the hay will tranſpire.

As ſoon as all danger of its heating is over, theſe cocks ſhould be made into ricks, and thatched. That which is laid up quite dry, will cut out of the rick perfectly green; but that which is heated much in the rick, will become brown; as is alſo the caſe with meadow-hay.

It requires ſome experience, to know at what degree of ripeneſs it is beſt to cut the ſeeded ſainfoin; becauſe all its ſeeds do not ripen at the ſame time. Some ears bloſſom before others; every ear begins bloſſoming at its lower part, and continues to blow gradually upward, for many days; ſo that before the flower is gone off at the top, the ſeeds are almoſt filled at the bottom. By theſe means, if the cutting be deferred till the top ſeeds are quite ripe, the lower, which are the beſt, would ſhed and be loſt. The beſt time therefore to cut it is, when the greateſt part of the ſeed is well filled, the firſt blown ripe, and the laſt blown beginning to be full.

The unripe ſeeds will ripen after cutting, and be, in all reſpects, as good as thoſe that were ripe before. Some, for want of obſerving this, have ſuffered their ſainfoin ſeed to ſtand till all of it has ſhed and been loſt in cutting.

Sainfoin ſhould never be cut in the heat of the day, while the ſun ſhines out; for then much even of the unripe ſeed will ſhed in mowing. The right time for this work is the morning or evening, when the dew has rendered the plants ſupple.

If the weather be fine and clear, the ſainfoin will ſoon dry ſufficiently in the ſwarths, without turning them: but if any rain has fallen, and there is a neceſſity for turning them, it ſhould be done very gently, while they are moiſt, and not two ſwarths together, as in the ſainfoin hay before it ſeeds. If the ſwarths are turned with the handle of the rake, it is beſt to raiſe up the ear-ſides firſt, and let the ſtub-ſide reſt on the ground in turning: but if it is done with the teeth of the rake, let the ſtub-ſide be lifted up, and the ears reſted on the earth.

If, however, it be convenient, there is no way of managing this ſeeded ſainſoin hay ſo good, as that I have mentioned for the lucerne, by hanging it over hurdles fixed in rows, on the field.

If ſainfoin be cocked at all, the ſooner it is done, the better; becauſe, if the ſwarths are dry, much of the ſeed will be loſt in ſeparating them; the ears being entangled together. When moiſt, the ſeed ſticks faſt in the ear; but when dry, it drops out with the leaſt touch or ſhaking.

There are two ways of threſhing it: the one in the field, the other in the barn. The firſt cannot be done, but in very fine weather, and while the ſun ſhines in the middle of the day. The beſt manner of performing this, is what was before deſcribed for the threſhing of cole-ſeed. The ſeed is then riddled through a large ſieve, to ſeparate it from the chaff and broken ſtalks; after which it is put into ſacks and carried into the barn to be winnowed. Care ſhould be taken, not to let the haulm or ſtraw get wet; for it would then be ſpoilt.

A very important, and at the ſame time a very difficult article is, the keeping of the ſeed that has been threſhed in the field, without having ever been wetted. If it be winnowed immediately,

ately, and only a little laid in a great heap, or put into a ſack, it will ferment to ſuch a degree in a few days, that the greateſt part of it will loſe its vegetative quality. During that fermentation, it will be very hot and ſmell ſour. Spreading it upon a barn-floor, though but ſeven or eight inches thick, will anſwer no end, unleſs it be frequently and regularly turned both day and night, till the heating is over: but even this will not make its colour keep ſo bright, as that which is well houſed, well dried, and threſhed in the winter. But if well got in, and laid up unthreſhed, it will keep without any danger of ſpoiling, becauſe it does not lie cloſe enough to heat. The beſt way to preſerve the ſeed threſhed in the field, is to put a layer of ſtraw upon a barn-floor, and upon that a thin layer of ſeed, then another layer of ſtraw, and another layer of ſeed, and ſo on alternately. Thus the ſeed mixing with the ſtraw, will be kept cool, and come out in the ſpring of as green a colour as it was put in.

The greateſt part of ſainfoin that is ſown, is ſpoiled by being indiſcreetly fed by cattle. Mr. Tull is againſt feeding it during the firſt or ſecond year, or in the ſpring of any other year. He ſays, he has recovered worn-out pieces of ſainfoin, by plowing them in alleys three feet wide, and leaving beds of ſainfoin of the ſame breadth between them. The plants, by extending their roots in theſe new plowed alleys, have recovered their vigor, and yielded good crops of hay. He adds, that ſainfoin is obſerved to enrich whatever ground it is planted on, even though a crop be taken off it yearly. This muſt either be from the nature of the culture employed, or by the great exudation from its roots.

I have already obſerved from M. de Chateauvieux's authority, that the rules and directions given for the tranſplanting of lucerne will anſwer equally well for the tranſplanting of ſainfoin. And it may alſo be obſerved, that, like lucerne, it is admirable for cutting into chaff for horſes, and is much uſed for this purpoſe by the ſtable-keepers in London, in order to ſave corn.

This excellent graſs is much cultivated in the neighbourhood of Saffron Walden, in Eſſex; and they find it there the beſt and moſt profitable of any that they raiſe. As the roots ſtrike deep in their chalky ſoil, this plant is not liable to be ſo much injured by drought as other graſſes are, whoſe fibres ſhoot horizontally, and lie near the ſurface. They are there of opinion, that the quantity of hay produced is greater, and the quality better, than any other; and that there is one advantage attending this graſs which renders it far ſuperior to others, which is, its excellence for feeding of milch-cows. The prodigious increaſe of milk which it makes is aſtoniſhing; being near double what is produced by any other green food. The milk is alſo better, and yields more cream than any other,* and of courſe the butter will be better coloured and higher flavored. Many cows have been known to give twelve pints of milk at a meal, and that twice a day, when fed on ſainfoin.

Sainfoin will always ſucceed well where the roots run deep: the worſt ſoil for it is, where there is a bed of cold wet clay, which the tender fibres cannot penetrate. This plant will make a greater increaſe of produce, by at leaſt thirty times, than common graſs or turf, on poor land. Where it meets with chalk, or ſtone, it will extend its roots through the cracks or chinks, to a very great depth, in ſearch of nouriſhment. The dryneſs is of more conſequence than the richneſs of land, for ſainfoin; although land that is both dry and rich, will always produce the largeſt crops.

It is moſt commonly ſowed broad-caſt, but is found to anſwer beſt in drills, eſpecially if the land be made fine by repeated plowing, harrowing, and rolling. Much depends on the depth this ſeed is ſown. If it be buried more than an inch deep, it will ſeldom grow; and if left uncovered, it will puſh out its roots above ground, and theſe will be killed by the air. March, and the beginning of April, are the beſt ſeaſons for ſowing it; as the ſeverity of the winter, and the drought of ſummer, are equally unfavorable to the young plants. A buſhel of ſeed ſown broadcaſt, or half that quantity in drills, if good, is ſufficient for an acre. The drills ſhould be thirty inches apart, to admit of horſe-hoeing between them. Much however depends on the goodneſs of the ſeed, which may be judged of by the following marks.

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* Bath Soc. Tranſ. Vol. I. p. 167.

The huſk being of a bright colour, the kernel plump, of a grey or blueiſh colour without, and if cut acroſs, greeniſh and freſh withinſide: if it be thin, furrowed, and of a yellowiſh caſt, it will ſeldom grow. When the plants ſtand ſingle, and have room to ſpread, they produce the greateſt quantity of herbage, and the ſeed ripens beſt. But farmers in general, from a miſtaken notion, that all that appears to be waſte ground is unprofitable, plant them ſo cloſe, that they choak and impoveriſh each other, and often die in a few years. Single plants run deepeſt, and draw moſt nouriſhment; they are alſo eaſieſt kept free from weeds. A ſingle plant will often produce half a pound of hay when dry. On rich land, this plant will yield two good crops in a year: but if the plants do not ſtand too thick, they will increaſe in ſize prodigiouſly the ſecond year.

No cattle ſhould be turned on the field the firſt winter after the corn is off with which it was ſown, as their feet would injure the young plants. Sheep ſhould not come on the following ſummer, becauſe they would bite off the crown of the plants, and prevent their ſhooting again. A ſmall quantity of ſoapers aſhes as a top-dreſſing will be of great ſervice, if laid on the firſt winter.

If the ſainfoin be cut juſt before it comes into bloom, it is admirable feed for horned cattle; and when cut thus early, will yield a ſecond crop the ſame year: but if it proves a wet ſeaſon, it is better to let it ſtand till its bloom is perfected: for great care muſt be taken in making it into hay, that the flowers do not drop off, as cows are very fond of them; and it requires more time in drying, than other hay. Sainfoin is ſo excellent a fodder for horſes, that they require no oats while they eat it, although they be worked hard all the time. Sheep will alſo be fattened with it, faſter than with any other food. A peck of ſainfoin feed will go as far as a peck and half of oats for horſes.

An acre of very ordinary land, when improved by this graſs, will maintain four cows very well, from the firſt of April to the end of November; and afford beſides enough of hay to make the greater part of their food the four following months. [illegible]

If the ſoil be tolerably good, a field of ſainfoin will laſt from fifteen to twenty years in prime: but at the end of ſeven or eight years, it will be neceſſary to lay on a moderate coat of well-rotted dung, or of marle if the ſoil be very light and ſandy. By ſuch means the future crops, and the duration of the plants in health and vigor, will be greatly increaſed and prolonged. Hence it will appear, that for good land, there is nothing equal to this graſs in point of advantage to the farmer.

Clover will laſt only two years in perfection; and if the ſoil be cold and moiſt, near half the plants will rot, and bald patches will be found in every part of the field the ſecond year. Beſides, from our frequent rains during the month of September, many crops left for feeding are loſt. But from the quantity and excellent quality of ſainfoin, its ripening early, and continuing in vigor ſo much longer, great riſk and certain expence is avoided, and a large annual profit accrues to the farmer.*

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* Bath Soc. Tranſ. Vol. II. p. 367.

SECTION III.

Of BURNET.

THIS plant is the *pimpinella* of Linnæus, the *pimprenelle* of the French, and a native of our own country. Mr. Miller, in deſcribing this plant, diſtinguiſhes ſeven different ſpecies of it; but the two larger ſorts are thoſe which are moſt proper for the uſes of huſbandry, and are by him called the *tragoſelinum majus, umbellâ candidâ*, or greater burnet ſaxifrage, with a white umbell, and the *tragoſelinum alterum majus*, another greater burnet ſaxifrage, both natives of this iſland, and equally hardy. The firſt grows naturally in woods, and on the ſides of banks near hedges; and the ſecond grows naturally in dry paſtures. In the meadows about Windſor, half the graſs is burnet; and Mr. Rocque, of Walham-Green, who formerly tried many experiments upon it, found that it would grow on the drieſt land; for he planted ſome of it even in the gravel walks in his garden, where every thing elſe was burnt up in ſummer; but this never withered: one of the qualities of burnet being to continue in ſap all the year.

This plant has been found to be of ſingular utility where flocks of ſheep are kept; becauſe, as it preſerves all its leaves unhurt by froſt, the farmer may thereby have a conſtant ſtock of green food for his ewes and lambs, at a time when turnips, and other ſucculent plants, may fail him. Beſides, it has been remarked, that nothing contributes more to improve the wool of ſheep, than feeding them on this graſs. For theſe reaſons, I would ſtrongly recommend the culture of this healthy evergreen to all ſheep-farmers; and at leaſt to mix a proportion of burnet with the other ſeeds, with which they lay down their lands to graſs; for this will give a moſt profitable and uſeful variety in all meadows.

When burnet is cultivated by itſelf, the land on which it is ſown ſhould be in fine tilth, and free from weeds, eſpecially couch graſs, which is the moſt hurtful of all. The ſeed may be covered with a very light harrow, for it will not bear to be buried deep, and the ground ſhould be rolled to lay it ſmooth for mowing. If the land is very poor, it ſhould be dunged, and the ſeed may be ſown any time between April and September.

Ten or twelve pounds of burnet-ſeed will be neceſſary for an acre of land; becauſe, when burnet is thin, the plants grow ſo large, that the hay made of them is coarſe. Theſe will riſe in eight or nine days after ſowing. If great numbers of weeds come up with them, it will be leſs chargeable to let the weeds grow with the burnet, till it is about five or ſix inches high; than to weed or hoe it. The whole may then be mowed and gathered clean off; and the quick growth of the burnet afterwards will choak all other weeds. The heart of the burnet being almoſt within the ground, the ſcythe cannot hurt it.

If the burnet does not grow equally every where, ſome plants muſt be drawn where they are too thick, and planted where they are thinneſt. Burnet may alſo be raiſed in a nurſery, and may be tranſplanted like lucerne, or ſainfoin, in the ſpring or autumn, when it ſhould be ſet out at ten or twelve inches diſtance every way, according to the richneſs of the ſoil.

The ſeed ſown in May might be mowed at the latter end of July. That ſown in June, will yield a pretty good crop, and muſt be cut but once; and the ſame with that which is ſowed in July. The plants produced by the ſeeds ſown in Auguſt, ſhould be mowed to deſtroy the weeds. Theſe mowings may be either given green to horſes, or be made into hay. The firſt ſpring-cutting will purge horſes; and Mr. Rocque was of opinion it would alſo cure the greaſe: but it is only the firſt crop that purges.

Burnet ſhould be mowed but once the firſt year, in order to leave it rank in the winter; and in this caſe it will be ready to feed in February or March, or to mow again in April.

If natural graſs grows amongſt the burnet, it may be harrowed in the ſame manner as lucerne: for having a tap-root, the harrow will not hurt it: but it muſt not be plowed, leſt the roots ſhould be broken in the ground.

When the ſeeds of this plant are to be ſaved, it muſt neither be fed nor mowed in the ſpring. The ſeed will ripen about the middle of June, when it muſt be reaped like wheat, and threſhed on a cloth. It ſhould be threſhed before it be too dry, becauſe it is apt to ſhed, and ſhould afterwards be dried thoroughly.

Burnet does not loſe its leaves in drying; and though the hay made of it be ſticky, it will after threſhing be very agreeable to horſes, which are ſo fond of it, that they never waſte any. One acre will produce upwards of three loads of hay, and above forty buſhels of ſeeds. Horſes are fonder of this ſeed, than they are of oats: and Mr. Rocque was of opinion, that it is more proper

per food for thoſe that do not labour hard, becauſe it is not of ſo hot a nature. Burnet bears ſeed twice a year, and will afterwards yield a very good ſpring crop.

It is not only good for horſes, but alſo for all manner of cattle; even for ſwine: and Mr. Rocque experienced another virtue in it, which is, that being ſtung by a waſp, the leaves of this plant rubbed pretty hard on the part ſo injured, immediately took off the inflammation.

Mr. Worlidge mentions as another excellent quality of this plant, that all good houſewives hold as an infallible rule, that there never need be bad cheeſe, or butter, where ſaxifrage grows: "from whence, adds he, it cometh that the Netherlands abound much in that commodity, and only, as is ſuppoſed, through the plenty of this herb."

The cultivation of this plant is attended with one great advantage, beſides that of not requiring a rich ſoil; which is, that it proves an excellent winter paſture, when hardly any thing elſe vegetates. It never blows or hoves cattle. It will flouriſh well on poor, light, ſandy, or ſtony ſoils, or even on dry chalky hills. The cultivation of it is neither hazardous nor expenſive. After the firſt year, it will be attended with little or no expence, as the flat circular ſpread of its leaves will keep down or prevent the growth of weeds.

On the failure of turnips, either from the fly or the black worm or ſlug, ſome farmers have ſown the land with burnet, and in March following had a fine paſture for their ſheep and lambs.

In Kent, they ſometimes ſow it late in the ſpring, with oats and barley, and it ſucceeds very well: but they generally ſow it ſingly in the beginning of July, when there is a proſpect of rain, on a ſmall piece of land, and in October following tranſplant it in rows two feet apart, and about a foot diſtant in the rows. This gives an opportunity of hoeing the intervals in the ſucceeding ſpring and ſummer. Some horſes will not eat it freely at firſt, but in two or three days they are generally very fond of it.

A gentleman near Maidſtone ſowed four acres as ſoon as the crop of oats was got off, which was the latter end of Auguſt. He threw in twelve pounds of ſeed per acre, broad-caſt; and no rain falling till the middle of September, the plants did not appear till the latter end of that month. There was, however, a good crop, and in ſpring he ſet the plants out with a turnip-hoe, at a foot diſtant from each other. But the drill mode is preferable, and ſaves more than half the ſeed.

This land was a poor, dry gravel, not worth three ſhillings an acre for any thing elſe.

The ſevereſt froſt never injures this plant; and the oftener it is fed, the thicker are its leaves, which ſpring conſtantly from its roots.*

SECTION IV.

Of CLOVER.

THERE are many ſpecies of this plant; but the ſorts generally cultivated for the food of cattle, are, the red, or Dutch clover (*trifolium purpureum majus*), the white meadow trefoil, honey-ſuckle graſs, or white Dutch clover (*trifolium pratenſe album*); and the yellow meadow trefoil, or hop-clover (*trifolium pratenſe luteum*).

The red clover, too well known to need any particular deſcription, is a biennial plant, whoſe roots decay after they have produced ſeeds: but if the plants are eaten down, or mowed, when they begin to flower, they will ſprout out anew, by which means they will continue longer than they would otherwiſe. The uſual quantity of ſeed for an acre is ten pounds; but many farmers give more, even to the length of twenty pounds, which is money thrown away; for if the land is in good tilth and good condition, ſix or eight pounds at moſt are perfectly ſufficient. In the choice of the ſeed, that which is of a light yellow colour, inclining to brown, ſhould be preferred; and the pale coloured thin ſeed ſhould be rejected.

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* Bath Soc. Tranſ. Vol. II. p. 129.

The general cuſtom in England is, to ſow this clover with barley or oats in the ſpring: and when the oats or barley are taken off the ground, the clover ſpreads and covers it, and remains one or two years: after which the land is plowed again for corn, and is really enriched by the clover, which being a ſucculent plant, abſorbs much nouriſhment from the atmoſphere, and this tranſudes through its roots into the ground. The clover ſeed ſhould not be ſown till the barley or oats are four, five, or ſix inches high; ſo that it may not overtake or over-top theſe grains in its growth, by which means it would hurt them greatly. When the clover ſeed is ſown, the field ſhould be buſh-harrowed, and if not wet, might be rolled to lay it ſmooth. If the barley or oats are drill-ſowed, the clover ſeed might be hoed in with the hand-hoe: this would deſtroy the riſing weeds, ſtir the earth, and cover the ſeeds; after which the field, if dry, may be rolled. There is another way of cultivating clover which I have practiſed with great ſucceſs, by ſowing this ſeed along with wheat in the ſpring: whether the wheat be ſown broad-caſt or in drills. This may be done towards the middle or end of March, when the wheat is not above ſix, ſeven, or eight inches high, and may therefore be buſh-harrowed and rolled as above directed for barley and oats. But if the wheat be drilled, the clover ſeed muſt then be hoed in, in the above mentioned manner; and this will be the ſecond hoeing to the wheat, which ſhould always receive one in the month of October or November.

The great advantage of this management is, that we thus have three profitable crops ſucceſſively, at ſmall expence. For the land is prepared for wheat by a fallowing crop of turnips or beans, &c. the wheat is followed by the clover with no extra expence but the ſeed; and the clover lay, plowed up, prepares the land for another crop of wheat; not only improved by the clover crop, but enriched by a ſort of green dreſſing from the plant on the ground: and for this reaſon the ſecond crop of the firſt year ſhould be plowed in, or at leaſt I would plow in the aftermath, without waiting for the ſecond year of clover, in which the plant is ſo apt to decline.

This ſecond crop of wheat muſt again be ſucceeded by a thorough plowing, and an ameliorating crop as before, which again becomes the preparation for wheat, and thus the circle moves round *ad infinitum*, unleſs it be varied for better purpoſes.

If clover is to ſtand only one year, which is undoubtedly beſt on ſtiff moiſt land, I can ſee no objection to throwing in a buſhel of rye-graſs ſeeds per acre, along with it: for if the clover ſhould fail, from any accident, ſtill that will bring a crop: or if it proves thin from any unforeſeen cauſe, the rye-graſs will make good the crop, and it will ſtand too ſhort a time to mat the ground, or do miſchief. But if this practice be objected to, which it certainly is by many farmers, they may ſtill guard againſt accidental failures, by ſowing two or three pounds of the yellow trefoil or hop-clover ſeed along with the other; which will help greatly to inſure a crop.

About the middle of May, this graſs will be fit to cut; when particular care ſhould be taken in making it into hay; for it requires more time to dry, than common graſs; though the leſs labour that is given to accompliſh this, the hay will be the better: for, like other artificial graſſes, the leaves and flowers of clover are its moſt material and moſt uſeful parts, and therefore ſhould not be ſhaken off by too much ſtirring and turning.

The time for cutting it is when it begins to flower; for if it ſtands much longer, the lower part of the ſtems, and the under leaves will turn yellow, and theſe laſt will fall off; and conſequently the quantity of the hay will then be much diminiſhed, and its flavor impaired. Care ſhould likewiſe be taken, not to ſtack it till it be thoroughly dry, for fear of its heating.

When the weather is good, it is an eaſy matter to get clover well in; when it is rainy, this work is attended with much trouble; and as clover is extremely ſucculent, every precaution muſt be taken to prevent its heating in the ſtack, which will create a mouldineſs that is not only diſagreeable, but even noxious to cattle. One very uſeful precaution uſed is, to ſtrew ſalt between the layers in the building of the rick, in the proportion of one pound to four hundred weight, or four pounds to the load. This will not only tend to prevent its heating or growing muſty, but will alſo render it more wholeſome, and conſequently more fattening to cattle.

Another precaution is the uſing of chimneys made of thin boards, with holes pierced through them, in the form of an obeliſk turned upſide down, ſo as they may be drawn eaſily out of the rick

rick before it is thatched. This will let off the hot and damp air from the center part of the rick; and if it be large, two ſuch chimneys may be required. If this hay be got in tolerably dry, it is beſt to have it thatched immediately, for fear of rainy weather.

There are indeed two ways of preventing ricks from being hurt by rains: the firſt is, by a tarpawling or large ſail tarred over, and hung on a round pole by means of eyes or loops in the middle of the cloth; by which contrivance it ſlides off or on, like a bed curtain on an iron rod, and hangs down equally on both ſides, forming a tent roof; for cords being fixed to the bottom part of it, are drawn tight and ſtaked or tied down exactly as tents are. This pole extends the whole length of the rick, and is ſupported by two perpendicular poles, one at each end.

The perpendicular poles are either fixed by being ſunk into the earth, or by ſhorter poles forming a triangular ſupport. The horizontal or roof pole, is ſometimes ſuſpended by ropes and pullies, ſo as to be lowered or hoiſted at pleaſure. But where there is a long leaſe, and the expence can be afforded, it is ſtill better to have a ſhed made with a thatched roof, and ſufficiently lofty to build a good rick below it, with ſpace between the rick and the roof for admitting a free circulation of air. This ſaves much trouble and more anxiety, and is preferable to a barn, which is too cloſe for hay, that has any remaining moiſture in it.

One acre of clover will feed as many cattle as four or five acres of common graſs: but they muſt not be ſuffered to eat too plentifully of it at firſt, leſt it burſt them. It ſhould be given them by degrees, till they are fully ſeaſoned to it: nor ſhould they ever be turned into this food in wet weather. Some ſow rye-graſs among their clover, on purpoſe to prevent the ill conſequence of cattle feeding on clover alone.

Mr. Maxwell thinks that clover is benefited by being ſown with barley or oats; becauſe, being weak and tender the firſt year, it would be overcome by weeds, which would grow in great numbers, if not kept down by a crop of corn, the ſtems of which, being at a ſufficient diſtance to admit the air to the clover, will at the ſame time alſo protect it from drought. The ſtubble proves a farther protection after the corn is cut down; and when it rots, it manures the ground.

Mr. Tull, on the contrary, diſapproves of ſowing red clover with barley; becauſe, he has known a crop greatly damaged by it in a wet ſummer: However, he alſo obſerves, that this may be prevented by drilling the clover after the barley is a hand high, or more: for then the barley will keep it under, and not ſuffer it to grow to any conſiderable ſize, till after harveſt. This I have already mentioned as being my own way of ſowing it broad-caſt.

It cannot be doubted, that clover would grow much larger and ſtronger if ſown in drills and hoed between the rows, than it does in the common broad-caſt way. I do not, however, remember to have ſeen this done, except by Mr. Ducket, whoſe authority alone is indeed ſufficient. His method of performing this is ſingular, for he drills it with a machine of his own invention, at the ſame time, and in the ſame furrows into which he drops the barley ſeed: whereas, it might certainly be done to more advantage after the barley is five or ſix inches high, and in the ſpaces between the rows of that grain, by means of Mr. Cooke's drill-plough, which would perform this work admirably.

The beſt way of ſaving the ſeed of clover is, what is mentioned by an Eſſex correſpondent of the Bath Society, who relates, that a neighbour of his had a field containing thirty-eight acres; the ſoil is a cold wet clay, which, for ſome years after he held it, ſcarcely paid its rent. Determined, however, to ſee what could be done with it, he under-drained it, and in the Spring, 1775, mended it with turf-earth, dug from the borders of fields and highways, and mixed with ſtable-dung. In March he gave it a good plowing, and ſowed it with Zealand barley: after the barley came up, he threw in ten pounds of the common red clover per acre. But ſix or ſeven would have been ſufficient. The advantages of the under-draining and manure were ſoon apparent. The barley yielded an exceeding fine crop, *viz.* ſeven quarters an acre throughout the field.

The following ſpring the clover ſhot early, and in the ſummer proved a very ſtrong crop. In May he turned in all his cattle, which by the 10th of June eat it off quite bare. He then took them out, and let the clover ſtand for ſeed. The ſummer proving wet, it ſucceeded well; and the average produce of the field was ſeven buſhels and an half per acre, the whole of which he ſold at thirty-nine ſhillings per buſhel, amounting in all to five hundred and fifty-five pounds, fifteen ſhillings, or fourteen pounds, twelve ſhillings and ſix pence per acre, beſides the feed to cattle.

As ſoon as the ſeed was off, the field was plowed for wheat, and ſowed broad-caſt with the red lammas kind. The crop was excellent, producing four quarters per acre.

With the ſame huſbandry, this gentleman had thirty-nine buſhels of clover ſeed from three acres, though the ſeaſon was dry; but his land was better than that above deſcribed *.

A gentleman farmer of Suffolk gives an account of his mode of managing clover to the ſame Society; which he ſays has always been attended with great ſucceſs.

In April, after his barley comes up, he ſows about eight pounds of clover ſeed per acre, and rolls the land. This anſwers two good purpoſes, namely, preſſing and covering the ſeed, and fixing the roots of the barley more firmly; which, in a light ſoil eſpecially, is of great ſervice.

After the corn is reaped, he forbears turning in any cattle till the crop of clover gets up pretty high and thick, which it will generally be by the end of October. He then turns in ſheep and other ſmall cattle for about a month, or, if the crop be large, ſix weeks. After this time it remains unfed till April. Cattle are then turned in, which eat it off pretty bare by May, at which time it is cleared for a crop of hay. If the ſeaſon be not remarkably dry, it will be ready for the firſt cutting by the middle of June, and generally yields two tons per acre. This gentleman found from experience, that the nearer the ground clover is cut the better, if it be cut early; but if

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* Bath Soc. Tranſ. Vol. I. p. 53.

it has ſtood too long, the bottoms of the ſtalks will be dry and naked. Add to this, that the ſtalk being drained of its moiſture, the root is alſo exhauſted, and will require longer time, before it ſends forth new ſhoots for a ſecond crop. In that caſe it ought not to be cut ſo low, as the hay would be more ſticky and coarſe. If rain follows the firſt cutting, the ſecond crop will be ready about the 10th of September. The beſt time is when the flowers are all full blown, and the earlieſt begin to turn brown.

When the ſecond crop is intended for ſeed, it is left ſtanding till near October. This makes it threſh the better, and there is no danger of the ſeed ſhedding in the field.

In order to prevent the inconveniencies that ſeed clover is liable to in a wet autumn, half the crop ſhould be left unfed in April; by which means it is fit for cutting near a month ſooner than it otherwiſe would be; and the ſecond, or ſeeding crop, is brought more into the ſummer. When the autumn proves wet, this method is attended with many advantages: the ſeed ripens better, and is threſhed with much leſs trouble and expence. The ſample is alſo better coloured, and the ſtraw being leſs beaten to pieces, makes better fodder for cattle.

The beſt method to prevent cattle from being hoved or choaked, by feeding on green clover, is, to let them remain at firſt no longer than till their bellies are full; and while feeding, to keep them conſtantly ſtirring. For as it is their greedineſs in ſwallowing the mouthfuls too faſt, and before it is ſufficiently chewed, which occaſions theſe accidents; if they are interrupted frequently, ſo as to give time for the balls to ſink into their maws before the next follow, this will effectually prevent ſuffocation*.

Whenever, notwithſtanding this precaution, any cattle ſwells or hoves, milk a cow that is well, and give the hoved beaſt a quart of the new milk, poured down its throat by means of a horn: if that does good, repeat the doſe ſoon after. But if this fails, open a vein and ſtab it in the flank, near enough the hip bone, to prevent wounding the entrails. Put then a quill or reed into the orifice, to keep it open, that the wind may have a free paſſage; and keep the animal in gentle motion till it works it off and recovers its breath.

The white clover, or white honey ſuckle, as it is called by farmers, as alſo the ſeveral ſorts of meadow trefoil, being perennial plants, and belonging more properly to the ſubject of permanent paſtures, will be treated of hereafter.

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* Bath Soc. Tranſ. Vol. I. p. 175.

SECTION V.

Of RYE-GRASS.

THIS graſs, which is C. Bauhin's *Gramen Loliacaceum, anguſtiore folio, et ſpicâ*, darnel-graſs with a narrow leaf and ſpike; and Linnæus's *Lolium ſpicâ muticâ*, darnel with a chaffy ſpike: for darnel-graſs, rye-graſs, and ray-graſs, are only different names of one and the ſame plant. We diſtinguiſh, indeed, two ſpecies of the rye-graſs, differing conſiderably, *viz.* the foregoing, which is the *lolium rubrum*, or red-darnel, and the *lolium album*, or white-darnel. It is this laſt, which is chiefly cultivated in England, eſpecially in ſtrong, cold land, upon which it will ſucceed better than any other ſpecies, and is an earlier feed in the ſpring: but it is ſomewhat coarſe, and unleſs it be cut early for hay, it becomes hard and wiry; for this ſort of graſs has but few leaves, and runs all to ſtalk. When cattle are turned in to feed on it, the remaining ſtalks or bents, as they are ſometimes called, ſhould be mowed off in June; for otherwiſe they dry upon the ground, and give the paſture the diſagreeable appearance of a ſtubble field, during all the latter part of ſummer; and are ſo troubleſome to the cattle at feed, by tickling their noſtrils, that nothing but want of better grazing, will compel them to eat of the young graſs which ſhoots up between theſe withered ſtems. Beſides, by permitting them to ſtand, the after growth of the graſs is retarded, and the verdure of the fields is loſt for ſeveral months. It is therefore good huſbandry to mow them and make them into hay, which will feed work-horſes in winter, and repay the expence.

In the foregoing ſection I have obſerved, that rye-graſs is ſometimes ſowed with clover; and that this has its advantages and diſadvantages.

If the land be wet and ſtrong, it certainly inſures a crop; being extremely hardy. Clover thus mixed is ſooner made into hay, with leſs danger of heating; and, being ſucculent of itſelf, is rather improved by the mixture. It is a very early graſs, and is therefore uſeful for ewes and lambs in the ſpring. It ſeldom laſts above three or four years, as it is commonly managed: but if the nature of its roots, and their ſending forth fibres from their joints be conſidered, it may ſurely be kept alive many years longer, by dunging and other dreſſings. This would make its roots tiller and meet; to the utter ſuppreſſion and deſtruction of all weeds, even couch-graſs, not excepted. This graſs mixed with clover makes good hay for winter's feed; but being a fibrous rooted plant, and binding the ſoil, this circumſtance has led many to think that it greatly impoveriſhes the land.

Rye-graſs is more cultivated in Scotland and in the north of England, than in this part of the country, and they there find many advantages from the culture of it. Its excellence in deſtroying weeds, in agreeing with wettiſh and even boggy ſoils, in reſiſting froſts, and its nurſing and bringing up clover, where otherwiſe it would not ſucceed, are all ſtrong recommendations of it, in the northern parts of this iſland.

They are not there of opinion, that it injures the crop of corn with which it is ſown; but, on the contrary, when the ſoil is looſe and open, they think it makes it firm, and prevents the corn from being lodged. Though this is the common method, yet they think it better to ſow rye-graſs by itſelf, if the land be poor, and ſtill better to ſummer fallow it, and ſow it in autumn.

They there ſow it ſometimes for hay, and ſometimes for paſture. It riſes early in the ſpring, and if the ſoil be dry and warm, affords good paſture all the winter. The beſt way to manage it, ſay they, is to cut it in ſpring, or the beginning of ſummer; for when allowed to get up in ſummer, it runs to ſeed and becomes diſagreeable to cattle: beſides, by this method a good crop may be expected in autumn; and when thus managed it makes good hay.

There has hitherto been ſo complete an ignorance, and want of attention to the uſe of proper graſs ſeeds, for laying down land, that the farmer has had no other reſource, but in red and white clover, and in rye-graſs: he never dreamed of collecting any other ſeeds for this purpoſe, and could find none other in the ſeed-ſhops. When, therefore, he deviated from this trodden path, he did what was infinitely worſe; for, by collecting the ſeeds of graſs from his own hay-loft, or that of his neighbour, he doubtleſs collected a greater variety of ſeeds, but a very dangerous one, in which thoſe of weeds made no inconſiderable proportion.

To thoſe huſbandmen therefore, who have no opportunity, or induſtry, to increaſe their reſources, I muſt ſtill recommend the red and white clover, the common trefoil or hop-clover; the burnet, and the rye-graſs, as the only ſeeds they can properly uſe; and if their land be tolerably dry and in good condition, they will not fail, with the acceſſion of other natural graſſes, to form a ſward in the courſe of a few years.

SECTION VI.

Of SUCCORY, or WILD ENDIVE.

IN France, a new artificial graſs has been diſcovered; if I may be allowed to give that name, and deſcription to a plant, which, though long known, has never been conſidered as a fodder for cattle, till very lately that it has been mentioned as ſuch, in a Memoir of Agriculture, publiſhed at Paris. The writer of the article is a M. Creté de Palluet, at St. Denis, near Paris, who ſtrongly recommends the cultivation of the greater ſuccory, or wild endive, and mentions its many advantages, particularly as being an excellent food for horſes, cattle, and ſheep; as being eaſily cultivated; as not being affected by the drought of ſummer, or by the ſevere ſtorms of autumn, or by the froſts of winter; and laſtly, as yielding a great weight of provender.

"The ſoil, ſays this writer, on which I ſowed my ſuccory, is a light ſand of a middling quality: the product may appear exaggerated, nor do I wiſh my word alone to be taken in this caſe.

What I advance can be proved by the part of the field that yet remains uncut. This plant is at the preſent time, the 20th of June 1787, ſeven, and even eight feet high, and is thick and full of leaves. The product of one cuttting on an arpent (which is nearly four fifths of an Engliſh acre), may be rated at fifty-five thouſand weight, and it may be cut four times in a year." This is a wonderful produce, and will no doubt attract the attention of our experimental farmers, who ought to make accurate trials to aſcertain the produce and the effects of this fodder, both when green and when made into hay.

The author ſays, a buſhel of ſeed will be enough for an arpent. It may be ſown in the ſpring, either alone, or along with a crop of ſpring corn, or with clover. It is perennial, and requires no extraordinary care. When made into hay, it was well reliſhed by cattle; but this writer thinks it more profitably employed when given green.

The Rev. Mr. Cooke, in a journey he made into France, ſaw this plant growing in the fields of M. de Palluet, at St. Denis: he was greatly ſtruck with the luxuriant growth of the plant, and with the accounts he received of it, and was thereby induced to bring home a ſmall quantity of the ſeeds, which he has diſtributed to ſome of his experimental friends; ſo that from them we may expect to learn the reſult with certainty.

At all events we may conclude, from the above directions of M. Creté, relative to its culture, that he muſt not be a very ſkilful agriculturiſt, when he ſpeaks of ſowing it with ſpring corn or with clover, at the ſame time that he mentions, its being fit to cut four times a year, and its growing to ſeven or eight feet high at each cutting. Under ſuch circumſtances, the fate of the ſpring corn, or clover, may eaſily be foretold.

ESSAY XI.

Of the Culture and Managemement of Graſs-Lands.

SECTION I.

Of MEADOWS.

WHATEVER crop is to be ſowed, ſet, or planted on arable land, it is of great importance to have it clean and in good tilth; but if that is not altogether the caſe, ſtill there may be a tolerable crop from it, and the farmer has it in his power to bring it into better order, when preparing it for a ſucceeding crop.

It is far otherwiſe in laying down a field to graſs with a view to form a permanent meadow; and therefore the land ſhould be in perfect good order in every reſpect before this is attempted. After what I have ſo often had occaſion to repeat in the courſe of this work, it is no doubt ſuperfluous to explain what I mean by land in perfect good order; unleſs I were here again to revert to thoſe firſt principles with which I ſet out, that land made dry by draining, clean by weeding, friable by plowing, and fertile by manuring, is land in the beſt order.

Let us then conclude, that every ſkilful and induſtrious farmer would make a point of having his land in this condition, before he lays it down to graſs. When this is the caſe, I do not object to the graſs ſeeds being ſown in the ſpring along with corn, ſuch as barley or oats, or buck-wheat.

This practice, beſides the profit ariſing from the crop of grain, which muſt be large from ſuch ground, will be attended with ſome other advantages, which are miſſed by autumnal ſowing. In the firſt place, the ſpring is the natural ſeaſon for all ſeeds to ſhoot; the crop of grain protects the ſhooting ſeed from the heat of the ſun, through the whole of the ſummer: the plants of grain while young, but particularly the buck-wheat, are rather diſcharging a nouriſhing ſap into the ground, than taking any from it; by which means the young graſſes are fed, not famiſhed, in their tender age; and by the time the grains are beginning to draw the nouriſhment, the graſſes are in a good way, with ſufficient ſtrength and vigor to take care of themſelves. The froſts of autumn cannot injure them, the ſeverer ones of winter cannot throw them out of the ground, and thus they acquire good roots, and flouriſh early in ſpring.

The time of ſowing the graſs ſeeds muſt be regulated in the ſame manner as I have mentioned for the ſowing of clover, that is, when the barley or oats with which they are ſowed is from four to ſix inches high; but if ſowed with buck-wheat, they may be both committed to the ground at the ſame time; for the buck-wheat is ſo rapid, as to require no advantage in point of time. When the graſs ſeeds are ſown, the buſh harrow drawn over the lands lengthways, and the roller acroſs them, will bury the ſeed ſufficiently. If they be ſown when the ground is a little moiſt, it will be the better: it may be buſh-harrowed immediately, but the rolling ſhould be delayed till it is dry. It ſhould be again buſh-harrowed and rolled in the end of September or beginning of October.

In theſe directions, I differ very eſſentially from Mr. Miller, who thinks, that when ground is laid down to graſs, no other ſeeds ſhould be ſown along with thoſe of the graſſes, and that the beſt ſeaſon to ſow them in is about the middle of September, or ſooner, when the land is dry, with an appearance of rain; becauſe, the ground being warm, and ſome ſhowers falling after the ſeed is ſown, the graſs will ſoon riſe and get ſufficient rooting in the ground before winter, not to be in danger of being turned out by the froſt, eſpecially if the ground be well rolled before the froſt comes on. If the graſs comes up well, this rolling ſhould be performed towards the end of October or beginning of November, and repeated again the beginning of March. But Mr. Miller forgets in giving this direction, that in ſtiff land and rainy ſeaſons, it is impoſſible to roll the land at either of the above mentioned times without poaching it, ſo as to do more harm than good. The ſwerd, ſays he, will in this caſe, be cloſe joined at the bottom, and a good crop of hay may be expected the ſame ſummer. In cold lands, which lie very open and expoſed, it will be right to ſow the ſeeds a month earlier, that the graſs may have time to get good rooting, before the cold ſeaſon comes on to ſtop its growth. If the ground cannot be prepared for ſowing in autumn, it may be ſown in the middle or latter end of March, according as the ſeaſon is early or late. The danger of ſowing late in the ſpring, is dry weather, particularly if the ſoil be dry and light. It will then be proper to roll the ground well ſoon after the ſeeds are ſown, to ſettle the ſurface and prevent their being blown away by the high winds in March. But it is here obſervable, that this circumſtance is a ſtrong argument in favor of ſowing theſe ſeeds with a ſpring crop of corn, which would conſolidate the land, and ſhade it previous to the ſowing of the graſs ſeeds.

I have no doubt but that the autumnal ſowing recommended by Mr. Miller, would ſucceed extremely well on good lands, and in favorable ſeaſons. I think the way I have ventured to recommend more certain, for I once laid down a field to graſs in autumn after a fallow, and ſowed it about the end of Auguſt: the froſts that ſeaſon happened to come on early, and turned out the whole of the graſs-ſeeds, in ſo much that I had no appearance of a crop in the ſpring; ſo that I was obliged to harrow it in April, and ſow it again with graſs-ſeeds; which then came up very well, and made a good ſwerd.

It has been obſerved by Mr. Stillingfleet, that it is wonderful to ſee how long mankind have neglected to make a proper advantage of plants, of ſuch advantage as graſſes are, and which are the chief food of cattle in almoſt every country: the huſbandman, for want of diſtinguiſhing and ſelecting graſſes for ſeed, fills his paſtures either with weeds, or with bad and improper graſſes; when by making a right choice, he might be ſure to have the beſt graſs, and in the greateſt abundance that the land could admit of. The common ſlovenly way of taking ſeeds from the hayrick, not only ſubjects the farmer to the inconvenience of ſowing a great mixture of rubbiſh, but alſo the ſeeds of many plants unfit for his ſoil; for the ſeeds ſowed on a dry ſoil, may have many only ſuitable to a moiſt ſoil, and thoſe ſowed on a moiſt ſoil, may have many only ſuitable to a dry one.

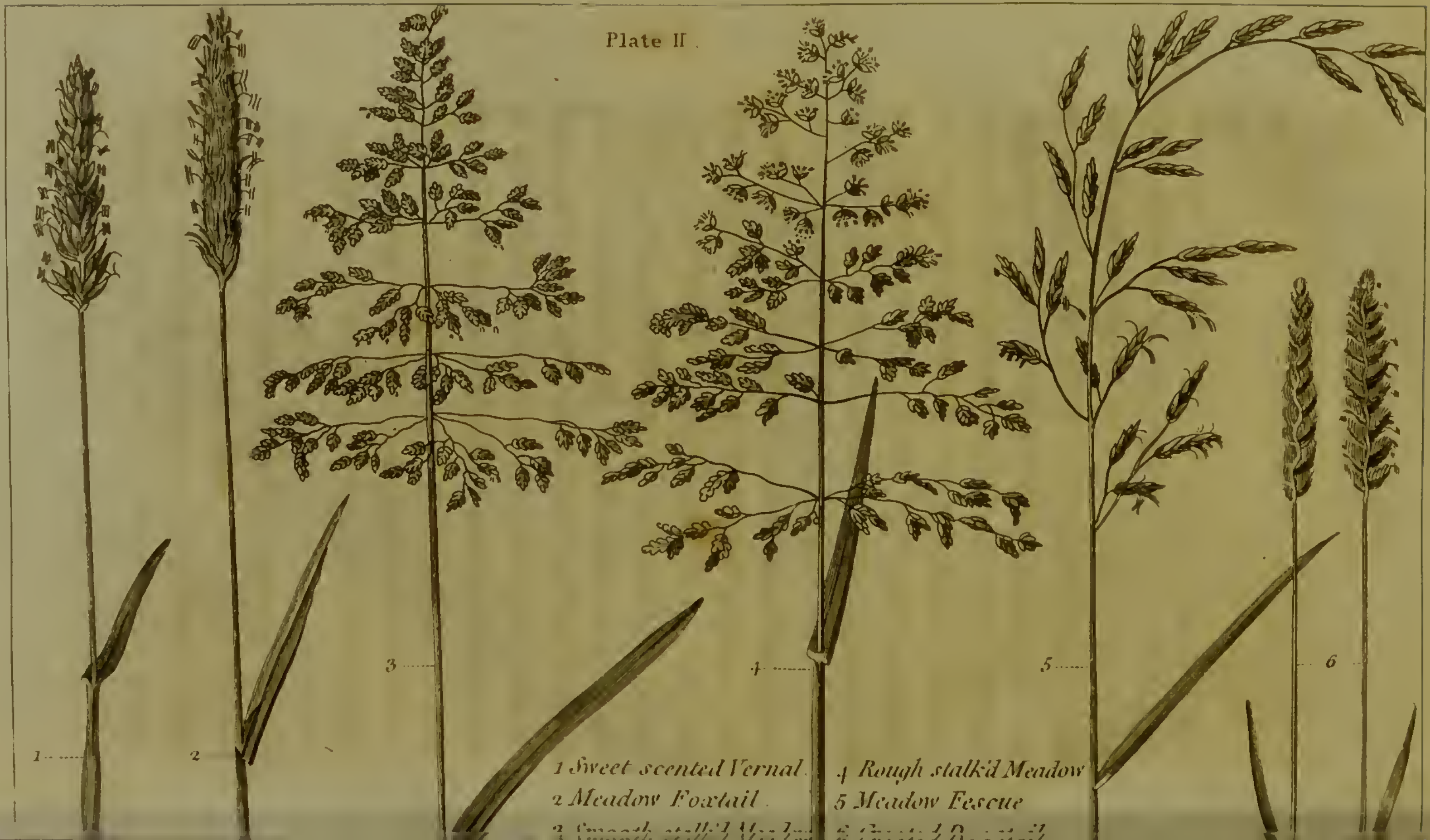
Arguments, however, in favor of eſtabliſhed cuſtom, are never wanting to the prejudiced and indolent farmer, who will tells us, that it is of little conſequence what ſeeds are uſed in the firſt laying down of ground; for if it be well tilled, and in good heart, it will ſoon produce ſpontaneouſly natural plants enough to form a ſwerd. There is no doubt of this fact; and in many parts of Derbyſhire, the indolent farmer does nothing but incloſe his land, and defend it from cattle, without ſowing it at all, when he wiſhes to have it converted into meadow. But is this any rational argument, or is it any proof of what is beſt to be done? Clearly not; for let the ſame farmer prepare his land properly, ſelect and ſow good ſeeds, and in the courſe of a few years he will find his profit from this ſenſible mode of proceeding, both in the quantity and quality of the product.

In my account of rye-graſs, I have mentioned thoſe ſeeds, with which the farmers in this country conſtantly lay down their lands to graſs. I have there ventured to recommend a mixture of burnet as a moſt uſeful addition to their liſt: but how deſireable would it be, if they could ſtill add a few more of our beſt native graſs ſeed; for native graſſes, for this purpoſe, are far preferable to foreign ones, which will always wear out by degrees, and give way to the natives.

The number of graſſes fit for the farmer, ſays Stillingfleet, is few; perhaps half a dozen, or half a ſcore, are all he need to cultivate: and how ſmall the trouble would be of ſuch a taſk, and how great the benefit, muſt be obvious to every one at firſt ſight. Would not any one be looked upon as wild, who ſhould ſow wheat, barley, oats, rye, &c. &c. along with the ſeeds of all ſorts of weeds? yet how is it much leſs abſurd to do, what is equivalent with reſpect to graſſes?

Mr. Curtis, at his botanic garden, Lambeth-Marſh, has the merit to have been the firſt that I know of, to have cultivated various graſſes, and to have ſaved their ſeeds for ſale. He in particular has recommended the culture of ſix different kinds,

Plate II.



1 Sweet scented Vernal.
2 Meadow Foxtail.
3 Smooth stalk'd Meadow
4 Rough stalk'd Meadow
5 Meadow Fescue
6 Crested Dogstail

kinds, of which he has given the following deſcriptions:

1. The ſweet ſcented vernal graſs, *(anthexanthum odoratum)*. which, of all the Engliſh graſſes, comes the firſt into bloſſom, except the blue dog's tail graſs: it is therefore valuable as an early graſs: it is valuable alſo for its readineſs to grow in all ſoils and ſituations, being found in bogs, in woods, in rich meadows, and in dry paſtures: in point of crop, it is not ſo productive as ſome, yet more ſo than others: cattle appear to be fond of it, and it is well known to be the only Engliſh graſs which is odoriferous: the agreeable ſcent of new made hay ariſes entirely from this graſs: hence its name of *odoratum*, or ſweet ſcented. The green leaves, when bruiſed, readily impart their perfume to the fingers, by which means the foliage may at all times be known; and perſons not ſkilled in botany may diſtinguiſh it, when in bloſſom, by its having two threads or ſtamina to each flower.

Of the ſix ſeveral graſſes recommended by Mr. Curtis, this is the leaſt productive in point of feed.

2. The meadow fox tail graſs (*alopecurus pratenſis*) produces its ſpike almoſt, and in ſome ſituations to the full, as early as the former: hence it is equally valuable as an early graſs; and as it

is much larger, and quicker in its growth, it is conſequently much more productive: it ſhoots very rapidly after mowing, producing a plentiful aftermath; and where land is rich, and two crops are not thought too much for it to bear, this ſeems to be the beſt adapted to ſuch a purpoſe, and ſhould therefore form a principal part of the crop. Its foliage may, perhaps, appear coarſe to ſome; but it ſhould be remembered, that no Engliſh graſs can be productive, that is not in ſome degree coarſe. In general, the great advantage ariſing from the earlineſs of this and the preceding graſs, is entirely loſt at a diſtance from London, where hay making commences late, and where the huſbandman ſeems to wait for a crop of univerſal indiſcriminate herbage, rather than one of graſs.

The meadow fox-tail is more confined as to its growth; thriving naturally in a moiſt ſoil only: hence it is beſt adapted to improve very wet ground, that may be drained of its ſuperfluous moiſture, or to form or meliorate meadows that have a moiſt bottom, and are not apt to be burnt up in dry ſummers.

Its ſeeds are eaſily collected; but a great number of them, one third at leaſt, are yearly deſtroyed by a very minute orange-coloured larva or maggot, which feeds on the embryo of the ſeed, and produces a very ſmall muſca or fly, probably the muſca-frit of Linnæus. The Rev. Mr. Swaine has made the ſame obſervations with reſpect to this inſect, which deſtroys the ſeed of the meadow fox-tail; and ſeems to be apprehenſive from the difficulty of collecting it uninjured, that it will be impoſſible ever to make it an object of general culture.*

This graſs is diſtinguiſhed, in ſome degree, by the largeneſs of its foliage, and by its producing a ſoft ſpike on a long ſtalk early in May. The meadow cat's-tail graſs produces a ſpike ſomewhat ſimilar, but rougher to the touch, and much later in the ſummer.

3. Smooth-ſtalked meadow-graſs (*poa pratenſis*). The foliage of this graſs begins to ſhoot, and to aſſume a beautiful verdure very early in the ſpring; but its flowering ſtems are not produceed ſo ſoon, by at leaſt a week, as thoſe of the meadow fox-tail. This trifling difference however, in point of earlineſs of flowering, does not prevent it from ranking very properly with the two preceding; and, where early graſſy paſturage is a deſideratum, Mr. Curtis is of opinion it cannot better be obtained than by a combination of theſe three; if a crop be at the ſame time an object, the meadow fox-tail graſs ſhould predominate.

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* Bath Soc. Tranſ. Vol. II. p. 76.

This graſs rather affects a dry than a moiſt ſituation; and hence it keeps its verdure in long continued dry weather, better than moſt others; but it will thrive in either; will grow on the top of a dry wall, but much more luxuriantly in a rich meadow: it is to be obſerved, however, that it has a root which creeps like the couch-graſs, and is almoſt as difficult to extirpate: it ought, therefore, to be cautiouſly introduced, where the paſturage is not intended to be permanent.

The characters which ſerve to diſtinguiſh the *poa pratenſis* from the *poa trivialis*, are, that the former has a ſmooth ſtalk, the latter a rough one, perceptible when drawn betwixt the thumb and finger, and which ariſes from little ſharp points, viſible when the ſheath of the leaf which covers the ſtalk is magnified. The *trivialis* has a long pointed membrane at the baſe of the leaf; the *pratenſis* a ſhort blunt one.

4. Rough-ſtalked meadow-graſs (*poa trivialis*). Similar as this and the preceding graſs are in their appearance, particularly in their mode of flowering, they differ very eſſentially in their qualities. While the ſmooth-ſtalked meadow-graſs is found chiefly in dry paſtures, the rough-ſtalked occurs principally in moiſt meadows, or on the edges of wet ditches: it loves moiſture, and a ſituation that is rather ſhady: hence, though there are few

graſſes more productive, or better adapted for hay or paſturage, it is a tender graſs, and liable to be injured by extreme cold, or exceſſive drought: in wet ground, near the Thames, it has been obſerved to grow very tall, while on poor land it is ſeen to be altogether as diminutive: it is perhaps no ſmall recommendation of it, that it is a principal graſs in that uncommonly productive meadow near Saliſbury, which I ſhall have occaſion to mention hereafter.

It is remarkable, that the ſeeds of the *poa trivialis* and *poa pratenſis*, but more eſpecially thoſe of the former, are apt to be entangled, and adhere to each other, as if cobwebs had been intermixed with them.

5. Meadow feſcue-graſs *(feſtuca pratenſis)*. Of the ſeveral graſſes here recommended, this comes the neareſt in its appearance to rye-graſs, to which, however, it ſeems in many reſpects to be ſuperior, at leaſt for the purpoſe of forming or improving meadows: it is larger, and more productive of foliage; it is ſtrictly perennial, it is very hardy, and will thrive not only in very wet, but alſo in dry ground: it has been found in the ſand-pits at Charlton, and the oſier-grounds at Batterſea; and it abounds in the very beſt meadows about London. Mr. Curtis knows of no graſs more likely to ſupply the deficiencies com-

plained of in rye-graſs; and yet it has not, that he knows, been particularly recommended. One quality it has, which bids fair to introduce it quickly into more general uſe; it produces more ſeeds than any of the others, and they are eaſily gathered, and grow readily. In one reſpect, it is inferior to the three former graſſes; it does not produce its flowering ſtems earlier than about the middle of June, a fortnight or three weeks later than the meadow fox-tail; yet it cannot be conſidered as a late graſs, as moſt of the Agroſtis tribe, and the meadow cat's-tail, flower at leaſt three weeks later. It muſt be carefully diſtinguiſhed from the *feſtuca elatior*, or tall feſcue, which is a very ſimilar, but much coarſer graſs.

6. Creſted dog's-tail graſs (*Cynoſurus criſtatus*). It is chiefly from the great character which this graſs bears as a favorite and wholeſome food for ſheep, and from its being found in our ſoundeſt and beſt paſtures, that it is here recommended. It grows naturally in dry ſituations, and will not thrive in meadows that are very wet: it flowers about the ſame time as the meadow feſcue, and is not very productive of foliage. As its flowering ſtems are always left untouched by cattle, its ſeeds may eaſily be collected, where the paſturage is fed, not mown.

Of the above ſix graſſes, it will appear that the meadow fox-tail, and rough ſtalked meadow, are fitteſt for moiſt land.

The meadow feſcue, and ſweet ſcented vernal, are fitteſt for land either moiſt or moderately dry.

The ſmooth-ſtalked meadow, and creſted dog's-tail, are fitteſt for dry paſture.

The order of their flowering is,

1, Sweet-ſcented vernal; 2, meadow fox-tail; 3, ſmooth-ſtalked meadow; 4, rough-ſtalked meadow; 5, meadow feſcue; 6. creſted dog's-tail.

Mr. Curtis could eaſily have added many more graſſes to this liſt, and thoſe too highly deſerving of a place in it; but by recommending too many, the difficulty of introducing any might be increaſed, without an adequate advantage from the variety. I will, however, avail myſelf of his information, to mention ſuch other of the Engliſh graſſes as appeared to him moſt worthy of obſervation, *viz.*

Tall oat-graſs, *(avena elatior)*: common in wet meadows, and by the ſides of hedges; early, and very productive, but coarſe.

Yellow oat-graſs, *(avena flaveſcens)*: affects a dry ſoil, is early, and productive; bids fair to make a good ſheep-paſture.

Rough oat-graſs, *(avena pubeſcens)*: ſoil and ſituation nearly ſimilar to that of the meadow feſcue: early, hardy, and productive.

Upright brome-graſs, *(bromus erectus)*: peculiar to chalky ſoils, early, and productive; promiſes to be a good graſs for chalky lands, and thrives indeed very well on others.

Blue dog's-tail graſs, *(cynoſurus cæruleus)*: earlieſt of all the graſſes, grows naturally on the higheſt lime-ſtone rocks in the northern parts of Great-Britain; not very productive, yet may, perhaps, anſwer in certain ſituations, eſpecially as a graſs for ſheep; bears the drought of ſummer remarkably well: at all events, ſeems more likely to anſwer than the ſheep's feſcue-graſs, on which ſuch encomiums have been moſt unjuſtly laviſhed.*

Rough cock's-foot graſs, *(dactylis glomeratus)*:

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* From this obſervation, Mr. Curtis ſeems to have no great opinion of the ſheep's feſcue, which is ſo much admired by others, and of which the Rev. Mr. Swaine writes thus to the Bath Society, (Vol. II. p. 83.) "I apprehend this graſs to be the moſt valuable of all. It was obſerved to grow and thrive on lands of all qualities, and in all ſituations, from the drieſt upland paſtures, to the very moiſt parts of meadows. It does not part with the ſeeds till ſome time after they are ripe, and even quite dry. It makes the thickeſt and cleareſt pile of any of them, and ſends up but few flower ſtalks in proportion to its leaves. I am almoſt perſuaded, that this graſs will hereafter become as generally cultivated as ray-graſs is at preſent. It flowers in June, and is ripe in July."

a rough, coarſe graſs, but extremely hardy and productive; ſoil and ſituation the ſame as for the meadow feſcue.

Tall feſcue graſs, (*feſtuca elatior*): tall and coarſe, but very productive; affects wet ſituations.

Hard feſcue graſs, (*feſtuca duriuſcula*): affects ſuch ſituations as the ſmooth-ſtalked meadow-graſs; is early, and tolerably productive: its foliage is fine, and of a beautiful green; hence it has been thought very fit for a graſs-plot or bowling-green; but it is apt to grow thin and die away.

Meadow cat's-tail graſs, (*phleum pratenſe*): affects wet ſituations, is very productive, but coarſe and late.

Mr. Curtis has formed a packet of the ſix ſorts of ſeeds above mentioned, and gives the following directions for cultivating them.

If a piece of ground can be had, that is neither very moiſt nor very dry, it will anſwer for all the ſeeds; they may then be ſown on one ſpot: but if ſuch a piece cannot be obtained, they muſt be ſown on ſeparate ſpots, according to their reſpective qualities; no matter whether in a garden, a nurſery, or a field, provided it be well ſecured and clean. Dig up the ground level, and rake it, then ſow each kind of ſeed thinly in a ſeparate row, each row about a foot apart, and cover them over lightly with the earth: the latter end of Auguſt, or beginning of September, will be the moſt proper time for this buſineſs. If the weather be not uncommonly dry, the ſeeds will quickly vegetate; and the only attention they will require will be, to be carefully weeded: in about a fortnight from their coming up, ſuch of the plants as grow thickly together may be thinned, and thoſe which are up tranſplanted, ſo as to make more rows of the ſame graſs.

If the winter ſhould be very ſevere, though natives, as ſeedlings they may receive injury; therefore it will not be amiſs to protect them with mats, fern, or by ſome other contrivance.

Advantage ſhould be taken of the firſt dry weather in the ſpring, to roll or tread them down, in order to faſten their roots in the earth, which the froſt generally looſens: care muſt ſtill be taken to keep them perfectly clear from weeds. As the ſpring advances, many of them will throw up their flowering ſtems, and ſome of them will continue to do ſo all the ſummer. As the ſeed in each ſpike or panicle ripens, it ſhould be very carefully gathered, and ſown in the autumn, at which time the roots of the original plants, which will now bear ſeparating, ſhould be divided and tranſplanted, ſo as to form more rows: the roots of the ſmooth-ſtalked meadow-graſs, in particular, creeping like couch-graſs, may readily be increaſed in this way; and thus, by degrees, a large plantation of theſe graſſes may be formed, and much ſeed collected.

While the ſeeds are thus increaſing, the piece or pieces of ground which are intended to be laid down, ſhould be got in order. If very foul, perhaps the beſt practice (if paſture land) will be to pare off the ſwerd and burn it on the ground; or if this ſhould not be thought adviſeable, it will be proper to plow up the land and harrow it repeatedly; burning the roots of couch-graſs, and other noxious plants, till the ground is become tolerably clean; to render it perfectly ſo, ſome hoeing crop, as potatoes or turnips, ſhould be planted or ſown.

In this mode, the ground propoſed to be laid down, will be got into excellent order, without much expence; and being now ready to form into a meadow or paſture, ſhould be ſown broadcaſt, with the following compoſition, and in theſe proportions.

Meadow fox-tail	one pint
Meadow-feſcue	one ditto
Smooth-ſtalked meadow	half ditto
Rough-ſtalked meadow	half ditto
Creſted dog's-tail	quarter ditto
Sweet-ſcented vernal	quarter ditto

Dutch-clover, *trifolium repens* ...... half ditto

Wild red-clover, *trifolium pratenſe*, or in its ſtead, broad-clover of the ſhops, half ditto

Note. For wet land, the creſted dog's-tail, and ſmooth-ſtalked meadow, may be omitted, eſpecially the former.

Such a compoſition as this, ſown in the proportion of about two to two and a half buſhels per acre, on a ſuitable ſoil, in a favorable ſituation, would, as Mr. Curtis aſſerts, form in two years a moſt excellent meadow; and as all the plants ſown, are ſtrong, hearty perennials, they will not eaſily ſuffer their places to be uſurped by any noxious plants, which by manure or other means, in ſpite of all our endeavours, will be apt to inſinuate themſelves: if they ſhould, they muſt be carefully extirpated, for ſuch a meadow is deſerving of the greateſt attention; and Mr. Curtis ſeems to have little doubt, but at ſome future time, it will become as common a practice, to ſow meadows with a compoſition ſomewhat like this, as it now is to ſow a field of wheat or barley.

There is, indeed, no doubt but that this compoſition is a ſelection of very excellent graſſes: but Mr. Curtis has mentioned two, which he has not deſcribed, and which deſerve to be ſo, that they may be well underſtood by the huſbandman.

The *trifolium pratenſe purpureum*, or red meadow trefoil, as it is commonly called, is a native of Great-Britain, and found on the higheſt mountains of Scotland. This graſs is alſo known by the name of cow-graſs and cow-clover. It is perennial, and is eaſily diſtinguiſhed from the common broad clover; with which however it has been often confounded, even by botaniſts. The ſtalks of the red trefoil are weak and hairy, the ſtipulæ which embrace the foot ſtalks of the leaves are narrow and very hairy; the heads of the flowers are rounder than, and not ſo hairy as, thoſe of the clover, whoſe ſtalks are ſtrong, almoſt ſmooth, furrowed, and riſe twice the height of the other. The heads of the flowers of the meadow-trefoil are larger, more oval, and more hairy, than thoſe of clover; their petals open much wider, and their tubes are ſhorter.

The *trifolium alpeſtre* of Linnæus, is another ſpecies of the ſame genus of plants, and is diſtinguiſhed from the former, by having longer and narrower leaves and a creeping root, which alſo is perennial. This in meadows and paſtures is a valuable plant; but its ſeed is not to be found in the ſhops. Mr. Curtis is of opinion, that this is the plant properly called cow-graſs. It is by ſome called marle-graſs.

The ſpecies called yellow meadow trefoil, or hop-clover, is the *trifolium pratenſe luteum, capitula lupuli ;* and the ſmaller kind of this, commonly called none-ſuch, or black-ſeed, is the *trifolium luteum, lupulinum, minimum.* The former is what I have before mentioned, as being much uſed in this country for ſowing with clover: it is a hardy perennial plant, and is reckoned very wholeſome for horſes.

Our meadows afford us the white meadow trefoil, or honey ſuckle graſs, beſt known by the name of white Dutch clover, which is the *trifolium pratenſe album* of C. Bauhin, or *trifolium repens* of Mr. Curtis, and by far the beſt ſort of clover for laſting paſtures or meadows, becauſe it is the ſweeteſt and moſt abiding of all the plants of this kind. This white clover, beſides being perennial, ſends forth roots and ſhoots from every joint of its long trailing branches ; for it does not riſe high, and thereby forms the cloſeſt ſwerd of any of the artificial graſſes. It is exceedingly ſweet for all ſorts of cattle: for which reaſon a quantity of the ſeeds of this plant ſhould always be ſown with the other graſs ſeeds, on whatever land is intended to be laid down, and makes part of Mr. Curtis's compoſition for this purpoſe.

The ſeeds of this clover being imported annually from Holland in large quantities, is the reaſon why it has acquired the name of Dutch clover: though it is not more a native of that country than of this; for it is very common in the paſtures all over England. The ſeeds however, have never been much collected here, though they may be ſaved as eaſily as thoſe of the broad clover. It might therefore be worth the farmers while to ſow an acre or two with this white clover unmixed, merely for the ſake of its ſeeds, which are often ſold at a great price. He would thus ſave the expence of buying them himſelf, and would find purchaſers for any quantity he had to ſpare.

With reſpect to the manuring of meadows, it is neceſſary to obſerve, that unmixed dung cannot be laid over them with any degree of œconomy or effect, becauſe it will be dried, parched, and exhauſted by the ſun, air, and wind, before its mucilage and juices are waſhed into the ſoil.

To employ it therefore with moſt effect, it ſhould be intimately mixed with good mould or chalk, or road drift, or aſhes, or in ſhort any dry ſtuff, which ſhall have previouſly abſorbed its rich juices, and which, by ſtill detaining them, ſerves as the vehicle to convey them into the ſoil. Soap-aſhes thus mixed with dung, is an excellent dreſſing; as is ſugar-ſcum, and a variety of ſuch articles. The drainings of the farm yard are a very excellent dreſſing for a meadow, conveyed over it either by means of ſmall drains, or by a water-cart and pierced box; ſuch as is uſed for watering the ſtreets and roads around London.

It would be much the beſt way to tine-harrow a meadow before it is dreſſed; both to open the ſurface, and make a way for the manure to ſubſide and reach the roots of the plants, and alſo to clear off the moſs and other weeds that may have matted on the ſurface. M. Chateauvieux's three-coultered plough ſeems to me an admirable implement for this purpoſe; nor do I know any reaſon why it has not hitherto been very univerſally adopted in this country: Mr. Baker, of Dublin, made uſe of it very ſucceſsfully, under the name of a ſcarificator.

This implement is extremely ſimple, having only a beam, with three coulters fixed in it, and two handles, like thoſe of a plough, by which it is guided: the coulters are placed, two before and one behind, forming a triangle; and the diſtance at which they cut the ſoil is three or four inches. I prefer this implement to what we now give the name of ſcarificator, or drag-harrow: this is not, in my opinion, near ſo effectual for opening the earth, and cutting the roots of the plants, which makes them ſhoot out afreſh.

This three-coultered plough might be improved by wheels to regulate the depth to which the coulters ſhould go; and theſe might be increaſed to five in number. A meadow ſhould be manured every ſecond or third year, if we expect it to be productive.

The watering of meadows, where there is an opportunity to do it with advantage, is another great ſource of their fertility. Much difference of opinion has ariſen, even amongſt the farmers themſelves, about the real cauſe of the fertility occaſioned by this operation: but I apprehend it may flow from different cauſes, according to the nature and ſituation of the waters employed.

At Orcheſton St. Mary, about nine miles from Saliſbury, there is a very ſingular ſmall meadow, of about two acres and an half, belonging to Lord Rivers. It is ſituated on a little brook, is frequently overflowed, and ſometimes continues ſo great part of the winter, and bears the greateſt burthen in a wet ſeaſon. The graſs upon it generally grows to the height of about eighteen inches, and then falls and runs along the ground in knots, to the length of ſixteen or eighteen feet: but the farmer has known inſtances of its running to twenty-five feet in length.

It is mowed twice in a ſeaſon, and the average quantity is generally about twelve loads, or tons of hay, the firſt mowing, and ſix the ſecond, though ſometimes conſideraby more. The tythe of this meadow has been compounded for at nine pounds a year.

The graſs is of a ſweet nature: all cattle and even pigs eat it very greedily. When made into hay, it is excellent, and improves beaſts greatly. The farmer ſays, his horſes will eat it in preference to corn mixed with chaff, when both are ſet before them together. It is thought, that this graſs is a ſpecies of the *agroſtis polymorpha*, mentioned by Hudſon in his Flora Anglica *. Be that as it may, the extreme fertility of this little ſpot is no doubt owing to its being overflowed in the winter and ſpring by the adjoining ſtream: for, upon inquiry, it has been found, that when the ſeaſon is dry, and it has not been overflowed, the crop of graſs is not near ſo large. It has alſo been found, that the little ſtream with which it is watered, takes its riſe from among ſome limeſtone rocks, and comes down impregnated with that calcareous matter.

Heat and moiſture are doubtleſs the primary cauſes of vegetation, and therefore water, taken merely as a fluid, and carried over dry lands, will, when followed by heat, promote vegetation; but if theſe waters are impregnated with any noxious minerals, ſuch as copperas, alum, ſulphur, &c. they will check vegetation: if, on the contrary, they are impregnated with calcareous earths, as I have mentioned above, or if they are charged with manure, the drainage of farm yards, fine pulverized earth, &c. &c. which they depoſit on thoſe lands they overflow; then the cauſe of the great fertility of thoſe lands is viſible, and that fertility will be increaſed in proportion to the quantity of calcareous or feculent matter there depoſited.

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* Bath Soc. Tranſ. Vol. I. p. 97. Mr. Curtis having examined the graſs of this meadow very particularly, found a principal plant among it to be the *poa trivialis*.

Thoſe farmers who have, from their ſituation, opportunities of watering their meadows, very juſtly obſerve, that the water which has been uſed, or ſtrained, as they call it, is not ſo effectual as what comes immediately from the ſtream or river: this is natural, for the water having already made a depoſit of the matter with which it was charged, cannot be ſuppoſed to make another equally great. But in uſing water for this purpoſe, it would be an eaſy matter to eſtimate its value, by putting ſome into a milk pan, and letting it ſtand for five or ten days, to obſerve what depoſit it makes; or by filtrating it through fine bloſſom paper.

Watering of meadows has this advantage over other modes of conveying manure; that by ſubſiding, it carries down with it the fertilizing matter, which is thus conveyed to the roots of the plants, where it is really required. Watering alſo promotes the putrefaction of every vegetable and animal ſubſtance found in the earth, and thereby contributes greatly to meliorate the ſoil underneath the ſwerd.

If the ſpring proves dry, paſtures may be watered as ſoon as the froſty ſeaſon is over: and this may be continued till the graſs begins to ſhoot. But if the winter has been ſevere, and the earth remains moiſt, no current of water ſhould be admitted, till the earth looſened by the froſt is ſettled, and the ſurface become pretty dry: for even the gentleſt current would carry off the fine mould looſened by the froſt. After the graſs has begun to ſhoot, and the weather is become mild, the water ſhould be adminiſtered more ſparingly. Care ſhould be taken not to allow cattle to come upon land which has been lately watered, as they will hurt it much by poaching.

When there is a complete command of water, by means of channels and drains, the meadows may be overflowed after the firſt crop of hay is off the ground; but then only in the night time. When the ſecond crop of hay is off, the weather then becomes cooler, and the flooding may be uſed more freely, which will bring up a large crop of aftermath. The latter end of autumn is the ſeaſon when the water is richeſt and moſt impregnated, and may be the longeſt continued; but care ſhould be taken to let it off, before any froſt appears. The channels for conveying the water over the meadows ſhould have a very gentle declivity, as well as the drains which carry it off. One inch in an hundred feet is enough for the former, and one half that fall is ſufficient for the latter. The channels ſhould be led along the higheſt parts of the meadow; they ſhould be wide rather than deep, and diminiſh as they go, that they may more eaſily overflow. The drains, on the contrary, ſhould be on the loweſt ground, and increaſe as they run, that the waters may retire gently, and without devaſtation.

Watering or flooding of meadows, where the water is good, has added ſo amazingly to their fecundity, that it has often been thought worth while to be at the expence of erecting mills, and other engines, to raiſe the water for overflowing them.

When the produce of meadows is to be made into hay, the farmer will be directed in the ſeaſon of mowing it, by the quality of the graſs. When the crop is heavy, it ſhould be cut as ſoon as the bottom of the graſs grows yellow: for if it ſtands longer, more will be loſt by the rotting of the lower leaves, and the bad flavor they will communicate, than will be gained by any additional growth.

When circumſtances admit, the proper choice of time for cutting is, when the graſs is in full bloom, and rather earlier than later, leſt the ſtalks begin to harden; beſides, the more ſap that remains in the root, the ſooner the next crop will ſpring up. A dewy or duſky morning is beſt for cutting the graſs; for being then fulleſt of ſap, it ſtands beſt to the ſcythe. In the noon tide ſun it is dry, and reclines its head.

Farmers in general are not ſufficiently attentive to their hay-making. The great object to be attained is, to have it quite dry, that is, free from extraneous moiſture; but not from its natural ſap, which ſhould be preſerved as much as poſſible, and never will hurt it. The leſs hay is turned, or tumbled about, the better, ſo it be dry; and to accompliſh this, requires both attention and ſkill. A ſtrict obſervation of the weather is ſo neceſſary to direct all the operations of hay-making, that general rules only can be given, and the reſt muſt be left to prudence and practice.

Before I cloſe this ſection, it is neceſſary for me to obſerve, that different attempts have been made at different times, to introduce ſome of the American graſſes here; but without any ſucceſs, that I have ever heard of. The Society of Arts, &c.

in London, diſtributed ſome of the ſeeds of the herd or timothy-graſs, and alſo of the fowl-graſs, which were recommended by the Rev. Dr. Elliot, upwards of twenty-five years ago. It is however no great ſign of their ſucceſs, that we have never heard more mention made of them. This muſt always be the fate of foreign plants, when competing with the native productions of the ſoil, where earth, and air, and climate are more congenial to them.

There is, however, another trial of the ſame kind, now made, or making, to introduce a new American graſs, which is ſaid to unite the two genera of the *cornucopia* and *alopecurus*. It bears a long verticillate panicle, and ripens its ſeed about the middle of Auguſt. It is equally patient of exceſſive heat or cold. It propagates by root and joint, as well as by ſeed: it is perfectly tender and free from ſpines, down, or hair: it is always in a verdant ſtate: and either in the way of paſture or meadow, we are aſſured, that it promiſes to exceed every denomination of gramen in every climate.

In ſhort, we are told by Mr. Fraſer, of Chelſea, that this extraordinary graſs actually attains a higher degree of perfection in this country, than it does in its native ſoil of North America.

SECTION II.

Of PASTURES.

THERE is no branch of agriculture which is of greater importance, or that preſents a larger field for improvement, than the proper management of lands in paſturage. The good or bad ſtate of thoſe lands affects all the animals with which we are moſt intimately connected, and conſequently it very materially affects ourſelves, through that medium. It is obvious, that the health and good condition of the farmer's horſes, cows, ſheep, and hogs, depend very much upon his attention and care, not only to keep his paſtures in a productive ſtate, but alſo to keep them clear from weeds and plants of a noxious quality, and to ſubſtitute thoſe which are wholeſome, ſalutary, and medicinal.

The celebrated Linnæus relates a circumſtance which happened to him in his Dalekarlian journey, and which forcibly proves the utility, or rather, indeed, the neceſſity of a thorough attention to this ſubject. When he arrived at Tornea, the inhabitants complained to him, of a terrible diſeaſe that raged among the horned cattle, which died by hundreds, ſoon after their being turned into their ſpring paſtures. They requeſted Linnæus to conſider this affair, and give them his opinion.

This great man obſerved, with his uſual ſagacity, That the cattle died, as ſoon as they left off their winter fodder, and returned to grazing. That the diſeaſe diminiſhed as the ſummer advanced. That in the ſpring, the cows were driven into a meadow near the city, and that they chiefly died there. That their bellies ſwelled, they were ſeized with convulſions, and in a few days expired with dreadful bellowings. That no man dared to flay the recent carcaſſes, for their hands and faces ſwelled, were inflamed, and even mortified, and that death had ſometimes enſued.

Theſe and other circumſtances, made Linnæus ſuſpect poiſon; and as he paſſed over the river in a boat, he there beheld the long leaved water hemlock, which the beaſts, greedy of green food, had devoured in the ſpring, when little elſe preſented itſelf; but declined eating it, as the ſeaſon advanced, and thus the diſeaſe diminiſhed. He ſaw no more of this plant, till he came to the vaſt meadows near Limmengen, when he again found it along the road; and when he entered

that

that town, he heard the ſame complaints as at Tornea.

I have given this account the more at large, becauſe I could not have produced a ſtronger inſtance of the neceſſity of carefully adverting to the plants which prevail in paſtures.

On inſpecting paſture and meadow-lands, in general, many noxious and poiſonous plants will be found, and ſometimes in conſiderable quantities. Of theſe kinds are, among others, henbane, hemlock, the aconite, or deadly nightſhade, and ſeveral ſpecies of dropwort, which, if taken in by cows, with their food, &c. will generally cauſe diſeaſe, and ſometimes death.

It may be alleged, that inſtinct is a certain guide to almoſt every ſpecies of animals, in the choice of their food. This is generally, but not unexceptionably, true. If cattle were at liberty to range over extenſive tracts of paſturage, with a plenty always before them to chooſe out of, there would be little danger; but when herds of them are confined within narrow incloſures, where ſuch noxious plants abound, and kept there till little that is green remains, it is almoſt impoſſible but that ſome of the cattle muſt be diſagreeably affected by ſuch plants, when they are eaten.

In proportion then as paſture-lands are cleared of theſe and other noxious plants, the danger is leſſened; and a conſiderable advantage will be derived from ſuch lands being, by ſuch means, rendered capable of producing a larger quantity of wholeſome herbage.

All neat beaſts have a natural tendency to ſcouring and flatulent diſorders. It is therefore a duty of the greateſt importance to the farmer, to ſow and plant in his paſtures and hedges ſuch herbs, in proper quantities, as are found to be the beſt remedies for theſe and ſuch other complaints as cattle are moſt incident to. Among many that might be mentioned, the following herbs are very ſalutary; lovage, agrimony, carraway, and cummin.

The health and lives of people reſiding in the country, are in ſome meaſure dependent on the health and good condition of milch-cows; milk being a vegetable juice, partaking more or leſs of the good or bad qualities of the plants on which cows feed.

Milk, and its produce in cream, butter, cheeſe, and many of our luxuries, are conſtituent parts of our daily food, from the earlieſt to the laſt ſtage in life; conſequently great care ought to be taken, with reſpect to the food of animals, who furniſh us with ſo great and ſo neceſſary a part of our ſuſtenance.

The ſkilful and attentive agriculturiſt cannot therefore be employed in any purſuit that tends more to the intereſt and health of mankind, than the increaſing the quantity, and improving the quality of cows milk. The taſk will be arduous, but the reward will be ample.

That cows are frequently diſeaſed, is a well known fact: and it is alſo well known, that their diſeaſes generally proceed from unknown cauſes. Few dairies of cows remain a whole ſummer healthy. Five out of thirteen have been known to die in one ſeaſon; and the moſt noted Cow-Leaches could not diſcover, or even gueſs at the diſeaſe, or its cauſe.

There is much reaſon to believe, that the milk of diſeaſed cows is too often mixed with the reſt, and made into butter, cheeſe, &c. If then it appears, that cows are diſeaſed, and die annually, without the nature or cauſe of the diſtemper being diſcovered, and of diſtempers to which this ſpecies of animals are not naturally ſubject, it is to be preſumed the moſt reaſonable way is, to ſearch for theſe cauſes in their food.*

Many excellent meadows and paſtures are ſo over-run with buſhes, ſhrubs, weeds, mole-hills, ant-hills, and the like, that a great part of them is oftentimes wholly loſt, and a conſiderable portion of the remainder cannot be mowed but in patches, to the manifeſt detriment of the huſbandman, whoſe firſt care in that caſe, ſhould be the removing of theſe obſtacles.

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* Bath Soc. Tranſ. Vol I. p. 210.

I have already mentioned Mr. Platt's very good and eaſy directions for grubbing up ſhrubs and buſhes, by means of a large and ſtrong dung-fork.

The Rev. Dr. Elliot adviſes, from his own experience, when any buſhy growth is to be extirpated by cutting it down, always to chooſe for this buſineſs a cloudy day, in June, July, and Auguſt; becauſe the ſtumps will bleed more freely at ſuch a time, and conſequently will die ſooner, than when the hot rays of the ſun ſhine upon them and dry up the ſap. For the ſame reaſon, a ſharp implement uſed in cutting is preferable to a blunt one, as it leaves the mouths of the tubes more open, to allow the ſap to flow plentifully.

Traſh thus rooted up or cut down, but the former is the beſt, ſhould afterwards be burnt, in the manner before directed: and their aſhes will be of great ſervice to the ground, if ſpread upon it before the autumnal rains.

The beſt way to manage mole-hills and ant-hills is, to remove their contents in a ſmall cart or wheel-barrow to a convenient part of the field, and to mix them well with hot lime, or, failing that, with hot wood-aſhes, or ſoap-aſhes. This compoſt will make an excellent dreſſing for the field after it has lain ſome time, and ſhould then be ſpread over the ſurface of the ground. The ſpots on which the mole or ant-hills ſtood, ſhould be looſened with a ſpade, then dreſſed with the above compoſt, and laid down with clean graſs ſeeds. Thus, a fine graſs will be raiſed in thoſe places, inſtead of the coarſe benty growth, which occupied them before.

The general produce of ant-hills has often been, through miſtake, ſuppoſed to be wild thyme; and as this herb is ſalutary in its nature, farmers have ſuffered thoſe hills to remain in their paſtures, from an idea that they furniſhed a medicinal repaſt to their ſheep and cattle. But on a careful examination any one may be convinced, that in general the produce of ant-hills is, a little of the wild thyme, ſeldom touched by cattle, and a much larger quantity of poor, ſmall, ruſhy, ſour graſs, which is a pernicious kind of food both for cows and ſheep.

Draining of paſture land is likewiſe a vaſt improvement: for though meadows and paſtures, which are capable of being overflowed, produce a greater quantity of herbage than dry ſoils; yet where the wet lies too long and ſtagnates on the ground, it chills and ſours it, and the graſs will become rank and extremely coarſe. If care be not taken to drain ſuch land, the graſs will diminiſh by degrees, and will be ſucceeded by ruſhes and flags, and be reduced to little value. The ſoil moſt liable to this is, cold ſtiff clay, where the water cannot penetrate, ſo that the wet it receives in winter continues till exhaled by the heat of the ſun.

The beſt manner of draining theſe lands is, by doing what I have already directed for arable lands, which is, to draw deep furrows with the plough acroſs thoſe places where the water is apt to lodge, and afterwards to ſcour and deepen them with a ſpade. Theſe muſt be made to communicate with larger drains, or ditches, which ſhould then convey the collected water to a ſtream, pond, or lake. If no ſuch receptacle is within reach, ditches or tanks muſt be dug to receive the water, and the earth dug out of them ſhould be mixed with lime or marle, and ſpread on the land: making thus a virtue of neceſſity.

Meadows or paſtures which lie flat, and whoſe ſurface conſiſts of looſe earth, that affords an eaſy paſſage to water, whilſt a ſtiff ſoil underneath retains it, are apt to grow ſour and cold by means of this exceſs of moiſture. For theſe, the under-ground drains before directed are the moſt proper. Or, to mention one more, which is the moſt ſimple of all, becauſe it requires no materials but thoſe which the drain itſelf furniſhes: Let a labourer ſlide off a ſod or turf from the top of the propoſed drain, a little wider than his ſpade: this ſod or turf muſt be cut of a wedge form, the upper or graſs ſide being the narroweſt; this is eaſily done by the labourer's ſloping his ſpade in cutting the ſides. This turf is taken off in lengths of a foot or eighteen inches, and laid on one ſide of the drain. The ſpade is then employed to take out one ſpade-full more of mould under the turf; a narrow ſpade is employed to take out another depth of mould under the former; and laſtly, a ſcoop is employed, a little narrower than the ſecond ſpade; and thus we have a drain diminiſhing from top to bottom. Take then the turf, and, turning it upſide down, let it into the drain as far as it will go, rather preſſing it down ſo as to form like a keyſtone between the two ſides of the drain: as it will not and cannot go to the bottom, it will leave a cavity underneath, for the water courſe, and the mould may be replaced over it, and ſprinkled with graſs ſeeds. Such a drain will laſt ten, twelve, or twenty years, and may be made for a halfpenny a yard.

When theſe precautions have been taken, and the above mentioned obſtacles removed, the ground muſt be cleared from every plant which is not intended to make a part of the paſture: for it is extreme bad huſbandry, to ſuffer ſuch plants to grow on land, as ſhould not be eaten, or, if eaten, will injure the farmer's intereſt by hurting his cattle. It muſt be great negligence or indolence to ſuffer paſture-lands to remain over-run with hemlock, thiſtles, docks, ruſhes, &c. and the hedges and ditches to be filled with poiſonous plants, and the nettles, thiſtles, &c. to remain on the ſides of the roads till their ſeeds ripen and are carried by the winds into all the adjacent fields.

At the ſame time there are ſeveral plants, which, however improper or hurtful they may be in meadows and in paſtures, yet are not only uſeful, but even profitable, when in their proper places. Some of the principal ones I ſhall mention here. 1. Furze, whins, or gorſe, the *geniſta ſpinoſa* of C. Bauhin, and the *ulex* of Linnæus. Theſe propagate themſelves moſt rapidly by the ſeed, which is thrown from the pod by an elaſtic jerk, by which means it ſoon ſpreads itſelf all around, to a conſiderable diſtance. Where theſe ought to be removed, I have already mentioned the moſt effectual way of accompliſhing this buſineſs; but when unneceſſary to remove them, they will be found of utility, particularly in ſheep walks, where they afford ſhelter in the winter: beſides, they ſhed a great quantity of their thorny leaves, which manure the ſoil. They alſo afford ſome food for ſheep in winter, and may be cultivated to advantage on ſands, that are otherwiſe barren.

French furze ſeed ſown on the ſides of the little ſand-hills in Norfolk about forty years ago, firſt gave riſe to many improvements there; for they ſucceeded ſo well, and grew ſo faſt, that once in three or four years they were cut for fuel, and ſold well at Thetford, Brandon, Harling, Swafham, and places adjacent. This firſt excited the gentlemen in that neighbourhood to extend their ideas to other plantations, in which, by the judicious mixture of marle and clay with their ſands, they ſucceeded amazingly.

Where there are moveable ſands, which are ſometimes tranſported by the winds over the adjacent fields, the ſowing of French furze might moſt probably be found a cheap and effectual remedy.

The tops of the common Engliſh furze, when bruiſed a little ſo as to blunt their prickly points, have proved excellent fodder even to lean ſickly beaſts, and particularly to horſes, which they have frequently recovered and plumped up in a ſhort time. This cuſtom is much practiſed in ſeveral foreign countries, where furze are cultivated purpoſely for fodder; and the peaſant thinks himſelf fortunate, that by breaking their ſpikes with a mallet, he is enabled to give his cattle wholeſome green food in the winter, when no other plant can be had fit for that uſe. It is ſaid, that Sir Capel Hanbury erected mills in Wales, many years ago, for bruiſing furze.

When furze are raiſed for the food of cattle, eſpecially on ſoils like the above-mentioned, their ſeeds ſhould be ſown in February, March, or April, and the ground ſhould be prepared as for barley. Six pounds will be ſufficient for an acre, and they ſhould be but barely covered.

The young plants muſt be preſerved from cattle during the firſt year, and they will be fit to mow or cut in the next. October is the proper time for cutting them. They will continue to ſhoot till Chriſtmas, and be fit for uſe till March. Horſes eat them as readily as they do hay, after they have been bruiſed; and it is ſaid, that an acre of land will produce fifteen tons of this fodder, and that it will go as far as an equal quantity of hay. Some mix the bruiſed furze with chopped ſtraw, an hundred of ſtraw to a ton of furze: but only the growth of the year ſhould be cut for cattle.

Poor, hungry, I may ſay, barren ſoils, that would not have let for a ſhilling an acre, have been made worth twenty ſhillings a year by ſowing them with furze ſeed, in places where fuel has been ſcarce; this being uſed for heating ovens, burning lime and bricks, and alſo for drying malt. This ſhews, that the pooreſt ſoil may be made profitable by induſtry and attention.

It was formerly a practice to plant furze for hedges; but theſe were ſoon exploded: for they grew naked at bottom, and ſpread themſelves over too much ground.

The Marquis of Turbilly obſerves, that cows, oxen, and moſt other cattle, as well as horſes, feed heartily upon, and are well fed by the bruiſed furze; and that we may be ſure corn will do well wherever this plant is met with.

The flowers of furze are excellent for bees.

2. Broom *(geniſta)*, if conſidered as a weed, is one of the moſt pernicious plants that grows upon land, becauſe it ſheds no leaves, but continually exhauſts the goodneſs of the ſoil. To deſtroy it on paſture land, the beſt way is, to cut it up in May, when it is fulleſt of ſap; becauſe the roots will thus be killed; whereas in pulling it up, part of them are apt to be left behind, and the leaſt bit will produce a new plant. Foddering of cattle on the land, will likewiſe deſtroy this growth; for

beſides their urine, their treading upon it and upon the ſoil which is hardened thereby, helps to kill it.

The twigs of broom, but eſpecially thoſe of the Spaniſh *(geniſta hiſpanica)* which are the longeſt, make good baſkets, are uſed for binding, and for making of dry hedges, and are alſo excellent for thatching; being very tough and of long duration. Ropes, likewiſe, and thoſe not bad ones, for barges and other ſmall craft, are made of the ſtringy fibres of this plant, of which the ancients uſed to make a kind of flax.

Mr. Bradley has calculated, that an acre of broom, is worth upwards of ſix pounds for the feeding of bees only, beſides the wyths and ſtumps, which will pay for the rent of the land. Certain it is, that no flowers are more pleaſing, or more profitable to bees, than thoſe of this plant, and eſpecially of the ſpecies called the Spaniſh broom.

The other uſes of broom are, that beſides yielding ſome food for ſheep in winter, it alſo affords ſome ſhelter, in that inclement ſeaſon, as well as from the heat of the ſun in the ſummer. They burn alſo into excellent aſhes, richly impregnated with ſalts.

3. Fern *(filix)* is one of the worſt of weeds, and one of the moſt difficult to deſtroy, where it

has deep ſoil to root in. Mr. Mortimer ſays, he has ſeen its roots eight feet deep in ſome grounds, and adds, that the beſt way of killing it is, by cutting it often while it is in graſs, particularly in the ſpring, at Midſummer, and Michaelmas, when the circulation of the ſap is ſtrongeſt. The tubes will then bleed to death, or if the ſap ſtagnates in them, the roots will ſoon rot.

The fern cut, when full of ſap, in the beginning of autumn, will make a moſt admirable ingredient in a mixen; becauſe no plant yields a greater quantity of alkaline ſalt. For this reaſon too, it burns to great advantage, for making of pot or pearl aſhes. The poor people in Scotland and Wales, ſenſible of this quality in fern aſhes, make them up into balls with water, dry them in the ſun, and uſe them for waſhing their linen, for which they think them nearly as good as ſoap.

Trees planted among fern will thrive very much, though it be on a hot gravel; the fern ſhading their roots, and keeping them moiſt and cool.

4. Wormwood (*abſinthium*) though a rank weed in paſtures, yields likewiſe a conſiderable quantity of fixed alkaline ſalt, which is much uſed for medicinal purpoſes. It is ſaid to be very effectual in reſtoring pricked or ſour wines.

5. Reeds, ruſhes, flags, and ſuch like aquatics, are beſt deſtroyed by draining. If the drains are cut deeper than their roots, their nouriſhment is cut off from them. A compoſt of hot lime, ſoap-aſhes and ſoot will likewiſe kill them, and ſo will plowing them up and laying the land up in high ridges to drain; or mowing them very early while the ſap is in them: but if hay be made of this growth, it ſhould not be dried too much; becauſe, that will increaſe its coarſeneſs. Plants of this kind always indicate a good ſoil; for a bad one will not nouriſh them, eſpecially reeds, the chief uſe of which is for thatching and making ſmall fences in gardens, &c.

Quantities of weeds, are frequently introduced into paſture-grounds, by the ill huſbandry of farmers, who, in hard winters and very dry ſummers, feed their cattle there, with foul ſtraw, hay, haulm, vetches, &c. intermixed with the weeds themſelves, or their ſeeds.

After the field is cleared of weeds, and the graſs withered in autumn, is the proper time to enrich the land with ſuitable manures. The advantage which paſtures receive from manures ſpread upon the ſurface of the ground, ariſes, as I have mentioned with regard to meadows, from the rich particles of theſe manures being waſhed down through the earth to the roots of the plants.

What I have ſaid, therefore, upon this ſubject in treating of meadows, applies equally to paſtures, both with regard to manures and the uſe of the ſcarificator, for their more eaſy admiſſion.

The ſhelly ſand on many parts of our ſea-coaſt, which I have before mentioned ſo much at large, ſmall gritty gravel, road-drift, lime-rubbiſh, the chopping of chalk or lime-ſtones, are all excellent manures for cold clayey paſtures.

Marle is the greateſt improver of ſandy ſoils, particularly the ſhell marle; for, being eaſily diſſolved, it readily enters and enriches the ground. It is therefore a treaſure wherever it is found: for it will ſupply the place of almoſt every other manure.

Where better manures cannot eaſily be come at, burnt clay is a good reſource for ſuch lands: for this purpoſe, dig a quantity of clay, ſuppoſe ſix or eight loads, to begin with, in ſpits about as big as common bricks. The beſt time for doing this is in the dry weather of ſummer; though the burning place ſhould be as much as poſſible in the ſhade, where it will burn better. Make a pyramid, as if for a bon-fire, of fern, ſtraw, furze, bruſh-wood, faggots, billets, coals, or other combuſtibles, and around this, lay your pieces of clay, two or three ſpits thick, till the whole pile is incloſed, excepting only a hole in the ſide, to light it at, and another at the top to make a draught. When the fire is well kindled, and the ſurrounding clay begins to be thoroughly heated, ſtop up theſe holes with clay, and continue to add, as before, more ſpits of the ſame, placed in ſuch order, that the fire may be pent up within the heap, and never ſuffered to go out; for if that ſhould happen, the work muſt begin again.

After that the firſt ſix or eight loads of this dryiſh clay are burnt, the heat within the heap will be ſo intenſe, that even damp clay, brought immediately from the pit, may be laid on without danger of extinguiſhing the fire, if it be not piled up too quick, or in very great quantities. Six or ſeven hundred loads are ſaid to have been ſometimes burnt in one heap in this manner: but then it has riſen too high to throw the clay up to the top of it, from the level of the ground. A kind of ſtage is therefore built in this caſe, and the ſpits of clay are wheeled up and thrown from thence on the heap. The pile muſt be tended night and day, till it is intirely burnt out. The price for burning is a halfpenny a buſhel heaped meaſure.

Nothing is ſo profitable to marſhy paſtures, as covering them with gravel. If the ſoil be naturally looſe, clay may be mixed with the gravel:

but if it be pretty ſtrong, clean gravel is beſt. The earth by degrees loſes its marſhy appearance, and the gravel ſeems to give warmth to the ſoil, ſo that the moiſture evaporates.

I have before ſtated this fact, when treating of the draining of bogs.

If dung is to be laid on paſture land, the ſame precaution ſhould be uſed in preparing it, as I have before recommended for meadows.

There are in this kingdom, vaſt tracts of land, known by the name of Downs, on which are fed large flocks of ſheep. Experience has proved, that though the graſs there is naturally ſhort, it is remarkably ſweet, and an excellent food for ſheep; and as the welfare of theſe creatures is of the utmoſt conſequence to one of the moſt eſſential branches of our manufactures, very great caution ſhould be obſerved in making any alteration in their food, till it be clearly evinced by experiment, that better paſtures does not injure their fleeces.

I have already obſerved, that burnet is ſaid to improve the wool of ſheep, but very ample and ſatisfactory experiments are ſtill wanting to eſtabliſh this fact.

Downs in general are of a looſe, ſandy, dry ſoil, covered with a very thin coat of mould, in which the graſs grows. In many places, a bed of gravel is ſoon met with, and in others chalk. Where ſand or gravel is the ſoil, the owner of ſuch land has generally in his power an eaſy mode of improving it; ſuch ſoils being hardly ever without marle, or a rich earth, underneath them, at a greater or leſs depth. A borer, to find out this earth, and a dreſſing of it when found, are all that is here wanted: but the dreſſing ſhould be light and frequently repeated. Where the bottom is chalk with a thin covering of earth, the chalk ſtrewed thinly on the ſurface is a good and cheap dreſſing: this, with the dung and ſtale of the ſheep, will keep the land in wonderful good order; and ſuch ſoils are perhaps better and more profitably employed as downs, than they would be if otherwiſe cultivated; and ſurely there are ſufficient improvements yet to be accompliſhed, all over Great Britain, without encroaching on theſe excellent and uſeful paſtures.

Whatever manures are laid upon paſtures, it will be of great utility to roll the ground well in the ſpring, and afterwards to pick up and carry off all ſtones, fragments, and other rubbiſh left on the ground and unburied by the roller. Farmers cannot be too careful in preventing the treading of cattle on their paſture-lands when wet.

The neceſſity of water, in all paſtures, is ſelf-

vident;

evident; as cattle cannot live without it; and the driving them far, is not only expenſive, but great loſs of time, and prejudicial to the health of the beaſts themſelves, particularly in hot weather. This is ſo ſenſibly felt in many parts of England, that people have been obliged to dig wells, even to ſuch a depth as frequently to require the aſſiſtance of horſes to draw the water. The means of rendering it eaſily come at, muſt therefore enhance the value of the land, where it can be ſo procured, and are of very eſſential conſequence to the huſbandman.

Where the ſurface of the ground is ſand or gravel, there is ſeldom occaſion to dig deep for water; becauſe ſuch ſoils lie generally on marle, or ſome other rich earth, through which the water cannot deſcend. Wherever water ſtagnates in ſuch ſoils, the farmer ſees at once, at what depth is the ſurface of the earth which retains it. But in other ſoils, and when this does not happen, he muſt have recourſe to the following directions, how to ſearch for it with the greateſt probability of ſucceſs.

Where ruſhes, reeds, flags, willows, or other aquatic plants grow ſpontaneouſly, or where frogs lie ſquatted down to the ground, to receive its moiſture; there is generally water underneath. It is an infallible ſign of ſubterraneous water, when a vapour a vapour is ſeen to ariſe from the ſame ſpot of ground. Or where ſwarms of little flies are ſeen in the ſame place, and near to the ground, in the morning after ſun-riſe. Or let a man, before ſun-riſe, lie down flat on his belly, reſting his chin on his fiſt placed cloſe to the ground, and looking horizontally and ſtedfaſtly to the eaſt. If he then ſees a tremulous vapour ariſe from any particular ſpot, let him mark the place, and water will be found underneath: but this experiment will only hold good on ground which is dry. Or dig a hole three feet ſquare and five feet deep, at ſun-ſet, place a pan or baſon, rubbed with oil on the inſide, at the bottom of the hole, and turn the pan upſide down; cover it with dry hay, or fern, or ſtraw, and over that with earth; and if any drops of water are found ſtanding on its inſide next day, a ſpring is not far off. Or if wool be left all night in a trench of this kind, and water can be ſqueezed out of it the next day; this too is a ſtrong ſign of water being near. I ſhall hereafter have occaſion to mention a method for making of artificial ſprings of water.

The month of Auguſt is generally looked upon as the moſt proper time to ſearch for water.

Wherever water is found, the next concern is, the way of preſerving it, and of coming eaſily at it. In clayey ſoils, ponds, for retaining it, may be formed with facility; but in looſe ſoils, other means muſt be uſed. For this purpoſe, mark out a circular piece of ground, whoſe diameter is twenty yards, more or leſs, and dig out a foot of earth ſo as to leave the ſides that depth perpendicular. Then begin to form it in the ſhape of a milk bowl, till the perpendicular depth in the center be four and a half or five feet. On the bottom and ſides ſpread lime finely powdered two or three inches thick. On this lay the togheſt and ſtiffeſt clay that can be found, ſpreading it over the lime, as it was placed in its natural bed, to the thickneſs of ſix or eight inches. This clay muſt be well beat down with wooden rammers, ſuch as paviors uſe.

If the clay be put on in two layers, and treated ſo, it is better than in one. Upon the clay thus prepared lay gravel or ſmall chalkſtones, ſix inches thick. The gravel ſhould have both the finer and coarſer parts ſcreened from it. No more clay ſhould be prepared for the gravel, than can be covered the ſame day; becauſe heat or froſt will be equally apt to catch it, which muſt be particularly guarded againſt, as it would make the pond loſe its water.

A piece of ground ſhould be choſen, to which there is a deſcent from all ſides, if it can be found conveniently ſituated. Winter, or early in ſpring, are the beſt ſeaſons for making theſe ponds, and each material ſhould be of equal thickneſs, from the middle to the edge. The leſs water is uſed in ſlacking the lime, the better it will be.

Salt marſhes are generally very rich land; but they moſt commonly lie ſo flat, that it is neceſſary for the owner to keep all the water he can from them. Theſe lands fatten all ſorts of cattle the ſooneſt of any, and preſerve ſheep moſt effectually from the rot: nay, if a ſheep is tainted, and ſent to the marſhes, the rot will proceed no farther. This is attributed to the ſalt; and a farmer has been known to drive his ſheep into the ſea, and to make them ſwallow ſea water, which he found to have the ſame effect as feeding on the ſalt marſhes.

I will here add, that when a farmer is obliged to feed his cattle with ſuch coarſe hay as they are not fond of, he will do well to mix ſalt with it in the proportion of two pound to one hundred weight. This will quicken their appetite, and may be the means of preſerving their health.

The American black graſs has been mentioned as a plant which had greatly improved their ſalt marſhes in that country. The ſeeds of it were in conſequence ſent for from New-England; but whether they were tried or with what ſucceſs, I have not been able to learn.

If ever the Spaniſh plant named Kali, from which barilla is made, were cultivated with ſucceſs in this country, I am perſuaded it muſt be on marſhes recovered from the ſea, and from whence it is excluded by embankments.

Small dairy, or graſs farms, in the neighbourhood of great towns, are certainly more profitable than ſmall arable ones. This the landlord knows; for he has always his rent better and more regularly paid from the former. But the advocates for the plough will plead, that the abuſe of any thing ought not to be confounded with its real excellence. The generality of corn farmers are moſt certainly egregious ſlovens; for lands devoted to the plough, and ſituated like the former, may be turned to great account. The produce of artificial graſſes alone, on ſuch land, may be made incredibly great and very profitable. The ſtraw yard is a moſt convenient place for the cow, when freed from the pail; and in the winter ſomething more is required than hay, and that ſomething is cabbages and roots, which are the produce of the plough.

Theſe and many other reaſons may be adduced, to ſhow the propriety of a middle courſe, and of judiciouſly blending arable with paſture land, in the proportion, perhaps, of three of the latter to two of the former.

A good dairy maid in Norfolk is reckoned ſufficient to take proper care of twenty cows, and one hog is the allowance to each cow.

Much depends on the choice of cows, and the care taken to mend their breed, and increaſe their milk. Cows of a red and black colour are preferable to white; of which laſt, not more than one ſhould be admitted into a dairy. But Mr. Bakewell, who is famous for his breed of cattle, ſeems, by Mr. Young's account, to give the preference to pale coloured ones, as an indication of finer fleſh. Heifers intended for breeding, ſhould not be bulled till the fourth year. The third, fourth, and fifth calves are the moſt robuſt, and of courſe the beſt to breed from. A bull ſhould be well fed, and kept from coition till the ſecond, if not till the third year. His vigor laſts only for two years.

In the choice of cows to breed from, ſee that they have eight or ten white teeth in their jaw, that the breaſt be broad, the tail long, the veins of the belly diſtinguiſhable, the brace of the navel large, a broad forehead, large black eyes, wide noſtrils and ears.

The ſeeds moſt eſteemed for promoting an increaſe of milk, are thoſe of trefoil, ſainfoin, angelica, pimpernel, cummin, and anniſe. About the walls of houſes, and on the inſides of hedges, lovage ſhould be ſown.

SECTION III.

Of ENCLOSURES.

THE encloſing of lands, and ſubdividing them into different fields, &c. is a moſt eſſential part of their improvement, and is attended with many real advantages, of which I ſhall here mention a few.

Encloſures aſcertain to every man his juſt and due property, and thereby prevent an infinity of treſpaſſes, injuries, the depredations of neighbours cattle, and other ſources of ruinous litigation. They keep the land warm, and add to its fertility, by ſcreening it from violent and nipping winds, which otherwiſe frequently deſtroy whole crops; and they alſo defend it from thoſe drying and ſcorching winds, which ſo often blaſt at once the huſbandman's expectations. They afford ſhade in ſummer, and ſhelter in winter, for cattle which would otherwiſe deſtroy more with their feet, than they would eat with their mouths; and which, for want of theſe, might, as Mr. Worlidge obſerves, loſe more of their fleſh in one ſultry day, than they would gain in three cool ones. Their cuttings afford fuel to the induſtrious huſbandman, and, if carefully planted and preſerved, they will even furniſh him with timber for his carts, ploughs, and other implements; ſometimes, perhaps, with uſeful fruits. They are a great encouragement to neat and clean huſbandry, and by protecting, increaſe the crops. For it has been generally remarked, that well encloſed countries not only maintain treble the number of inhabitants that the open ones do; but alſo, that theſe inhabitants are much better fed and clad, than the generality of thoſe inhabiting unencloſed countries.

The common objections againſt encloſures have been ſo well refuted by many able writers, and are daily invalidated by experience, that it would be idle to recapitulate them here. I ſhall therefore only mention one more eſſential advantage, that it enables the farmer to act as is moſt agreeable to him in ſowing when and what he pleaſes.

Every gentleman whoſe eſtate is not yet encloſed, and who is conſequently at liberty to chooſe the manner and means of doing it, will naturally begin with having it ſurveyed and planned, that he may be thereby enabled to have it divided and portioned out, with propriety and preciſion, ſo as to render it moſt beautiful, and moſt convenient. If he has a place of reſidence upon it, he may make the whole become an ornament to that reſidence, by a judicious and ſkilful diſpoſition of his plantations, hedges, and farm houſes. The farms ſhould be ſo divided, that the dwelling of each tenant may be as centrical in his fields as conveniency will admit of; to prevent length of carriage, and to facilitate his own attendance.

Farms of a midling ſize, have always been obſerved to yield the greateſt proportional rent, and middle ſized encloſures conſtantly produce the moſt plentiful crops.

Encloſures for arable land ſhould be larger than for paſtures; that the ſoil may be kept dry, and the corn be well aired: for this will contribute greatly to prevent mildew, and other diſtempers ariſing from too much moiſture, and want of air.

As foreſt trees, by their ſhade and wide extended roots, are found to be evidently injurious both to corn and graſs, few of them ſhould ever be admitted into the hedges which divide fields, and thoſe few ſhould be planted with judgment, ſo as to do as little harm as poſſible. But as foreſt trees are uſeful, and even neceſſary, for a variety of purpoſes, as well as for warmth and ornament; the landlord ſhould diſpoſe of them in plantations, on ſuch lands as are ſuitable to the nature of the trees, where they can do no injury, and where the lands cannot be otherwiſe occupied to ſuch advantage: and of ſuch lands, and of ſuch plantations, with the profits accruing from them, I have before taken particular notice.

In countries where, in lieu of hedges, the fences are made of rough ſtones, piled dry upon one another, with a row or two of ſods at top, to keep them together, it would be well judged to carry them through the middle of plantations where they would be moſt out of ſight; becauſe, however uſeful, they are but diſagreeable objects.

The moſt uſual way of incloſing land in this country is, with a ditch and bank ſet with a hedge of hawthorn, crabs, black-thorn, holly, or, which is ſtill more common, of white-thorn, or quick. In planting ſuch hedges, attention ſhould be paid to the nature of the ſoil where they are to be placed; ſo that aquatics may be planted in moiſt ſoils, and on dry ones plants that are ſuitable.

Mr. Miller recommends the white and the black-thorns and the crab for outward fences, but does not approve of intermixing them. The white-thorn, he thinks, is the beſt quick, becauſe moſt eaſily procured, is very hardy and durable, and may be rendered the cloſeſt of any fence, by proper clipping: it will thrive on any well looſened ſoil, except very dry gravel or ſand.

The holly makes an excellent fence, and is preferable to every other plant; but is difficult to be made to grow at firſt, and grows ſlowly. However, when it is up, it makes amends by its height, ſtrength, and thickneſs. It delights moſt in ſtrong grounds; but will grow upon the drieſt gravel, even among rocks and ſtones. It is raiſed from ſets or berries, like the white-thorn, and are both beſt ſown in the place where they are intended to ſtand.

They ſhould be kept well weeded till they acquire height and ſtrength.

Alder planted on a bank, the ſide of which is waſhed with a river or ſtream, will make an extraordinary fence, and preſerve the bank from being undermined by the water; becauſe it is continually putting forth from the lower roots, ſuckers which are of great advantage where the current waſhes away the earth.

Sticks of elder, ten or twelve feet long, ſtuck ſloping in a bank, ſo as to form a kind of lozenged chequer work, will produce the quickeſt, though not the ſtrongeſt hedge, of any thing, and will be a good ſhelter.

Ditches ſhould be at leaſt ſix feet wide at top, three feet deep, and one foot and a half wide at bottom, that each ſide may have a proper ſlope, to prevent its ſliding down.

Beſides the above plants for hedges, the ſweet-brier or eglantine (dog-roſe) is much recommended by a correſpondent of the Society of Improvers in the Knowledge of Agriculture in Scotland, who planted them in the following manner. After marking out his ditch, he laid his plants about eighteen inches aſunder on the ſide graſs, and covered their roots with the firſt turfs, taken off the ſurface of the intended ditch. The earth ſide of the turfs was placed next to the roots, and over the turfs was laid the other earth from the ditch. In four or five years theſe plants made a fence, which no ſheep, cattle, or horſes, could paſs.

Old briers taken up and divided, make excellent plants, and where the fences are too thin, they may eaſily be thickened by laying down branches, which make ſhoots of ſix or ſeven feet in a year; and this plant bears clipping extremely well. Theſe hedges are beautiful when in flower, and always ſmell ſweet.

In the hedges which divide the fields of the farm, fruit trees may be planted: theſe too are beautiful in the bloſſoming ſeaſon: beſides, they yield a profit as well as ornament: or fruits may be grafted on ſtocks in the hedge, properly ſuited thereto; and the only objection to this is, the temptation thereby thrown in the way of idle people, to break over and ſpoil the fences, in order to come at the fruit. On the other hand it is alleged, if that fruit be only fit for cyder, it will be ſo ſour and uneatable, that no body will ever give themſelves the trouble of coming after it.

Fences made in marſhy grounds, require plants which delight in moiſt ſoils. Of this kind are particularly the black alder, the willow, and the poplar: the birch and the aſh will alſo thrive very well in ſuch places: but the alder is reckoned the beſt and moſt profitable. It likes a ſoil ſo moiſt as few other trees will thrive in, and is propagated either by layers, or truncheons about three feet long. The beſt time for planting theſe laſt is in February, or the beginning of March, when they ſhould be ſharpened at their larger end, and a hole made with an iron crow, or ſome ſuch utenſil, large enough to allow them to be thruſt in without ſtripping off the bark, which might occaſion their miſgiving. They ſhould be ſet at leaſt two feet deep, to prevent their being blown down by violent winds, and ſhould be kept clear of weeds till they get out of their reach.

If alders are raiſed by laying down the branches, this ſhould be done in October, and by the ſame time twelvemonth, they will have roots ſufficient to be tranſplanted, which muſt be done by digging a hole, and looſening the earth in the place where each plant is to ſtand. The young ſets ſhould be planted a foot and a half deep, and their tops ſhould be cut off to within nine inches of the ground, which will make them ſhoot out many branches.

The alder may be trained into very thick, cloſe hedges, to the height of twenty feet and upwards. It may be cut for hop-poles every fifth or ſixth year: it makes excellent pipes and ſtaves, for it laſts a long time under ground or in water: it is alſo much eſteemed by turners, plough-wrights, &c. and for making ſeveral utenſils in agriculture. Its bark yields a good black dye.

Mr. Miller enumerates fourteen different ſorts of willows, which grow beſt in moiſt ſoils, and may be eaſily propagated by planting cuttings, or ſets, either in ſpring or autumn: for theſe readily take root, and are of quick growth. Theſe will afford very profitable loppings every fifth or ſixth year.

The middle ſized, or long leaved red willow is that which is cultivated in oſier grounds, for baſket makers. They are cut every year, and ſometimes bring fifteen pounds an acre; but ten pounds is a common price. Theſe willows would therefore be profitable on boggy land, where few other things will thrive. Great care ſhould be taken to ſcreen them from cattle. Hoops for barrels are ſometimes made of them. The large wood, if found, is uſed for wooden heels of ſhoes, and for many kinds of light turnery ware.

The poplar may be propagated either from layers or cuttings, which will readily take root; and alſo from the ſuckers which the white ſort, commonly called the abele tree, ſends up from its roots in great plenty. Truncheons of this tree, two or three feet long, may be treated as before directed for thoſe of alder.

The black poplar is not ſo apt to take root from large truncheons; wherefore the better way with this is, to plant cuttings of a foot and a half long, put a foot deep in the ground. Mr. Miller ſays, he has planted cuttings of this tree, which in four years have been bigger in the trunk than a man's thigh, and near twenty feet high: but this was in a very moiſt ſoil. Their leaves are ſaid to be very good food for ſheep.

The wood of the poplar, and eſpecially of the abele, is much eſteemed on account of its whiteneſs, is very good for laying floors, where it will laſt many years; but being ſoft, is apt to take impreſſions. It is very proper for wainſcotting, becauſe it is leſs apt to ſwell or ſhrink than moſt other ſorts of wood. For turnery ware, none is equal to this, for whiteneſs and lightneſs. The bellows-makers prefer it for their uſe, as do ſhoemakers for heels. It is likewiſe very proper for light carts and for hop-poles, and its loppings afford good fuel.

The birch tree will grow on almoſt any ſoil, be it ever ſo barren for other plants: it will thrive equally in moiſt ſpringy land, or in dry gravel or ſand, though the ſurface be very ſhallow. The birch is uſed by broom-makers, and is excellent for hoops, for ſome ſorts of turnery ware, and ſome inſtruments of huſbandry. It is uſed abroad for making wooden ſhoes. It makes good fuel.

Birch trees are ſometimes tapped in the ſpring, and the ſap is drawn out to make a wine, which has been recommended for the ſtone and gravel. This, when well made, is the beſt taſted of all the artificial wines. The bark of this tree is almoſt incorruptible. Many houſes in Sweden are covered with it, and it laſts many years. The bark often outlives the body of the tree, and remains ſound when the wood is rotten.

The beſt way of propagating aſh trees is, to ſow them on the ſpot where they are wanted; for they may be eaſily thinned, and thoſe which remain will grow to a larger ſize than if they were tranſplanted. This tree, which is indeed very uſeful for many purpoſes, is of ſo exhauſting a nature to the ſoil where it grows, that it ought ſeldom or never to be admitted into hedge-rows; for it robs every plant within reach of its roots. It is particularly inconvenient in paſtures; for if cows eat of its leaves or ſhoots, all the butter that is made of their milk will be very rank. In dairy grounds, not an aſh is ſuffered to grow.

Some people prefer elm for diviſion hedges; for which purpoſe the beſt and quickeſt method of raiſing them is, when any trees are felled in the ſpring, to ſow, as corn is ſowed, the chips made in trimming or hewing them green, on a piece of ground newly plowed, after which harrow them in. Every chip, which has an eye, or bud-knot, or ſome bark on it, will immediately ſhoot, like the cuttings of potatoes; and the plants thus raiſed having no tap roots, but ſhooting their fibres horizontally, in the richeſt part of the ſoil, will be more ſafely and eaſily tranſplanted, than when raiſed from ſeeds, or in any other way.

For elm fences, the plants thus raiſed have greatly the advantage of others; as five or ſix, and frequently a greater number of ſtems, will ariſe from the ſame chip, and ſuch plants when cut down within three inches of the ground, will multiply their ſide ſhoots in proportion, and make a hedge thicker, without running to naked wood, than by any other method yet practiſed. If clipt for three or four years, they will be almoſt impenetrable.

Where rough flat ſtones are plentiful, as in moſt parts of Scotland, the northern counties of England, Cornwall, Devonſhire, &c. they have an exceeding good way of draining their land, making their fences, and forming their plantations, all by the ſame operation. Thus, at the diſtance of twenty, thirty, or forty feet, at pleaſure, they ſink two ditches, throwing the mould from both into the ſpace between. But as the upright ſides of theſe ditches would be apt to ſlide down, with the winter's froſt, they face them with rough ſtones, preſſing theſe ſtones well in towards the bank, and bedding them ſolid by means of the mould behind: they then cover them with turf or ſods for coping, and plant a quick hedge immediately within the wall and upon the looſe mould thrown out of the ditch, where it grows apace: in the ſpace between, is formed the plantation, where the young trees are placed very cloſe at firſt, and are thinned by degrees, as they require room to extend in.

It is obvious, that where ſtones are not near at hand, the ſame ſort of fence might be made by facing the upright ſide of the ditch with ſod-work, inſtead of the ſtone wall above deſcribed.

This would doubtleſs be a ſaving of expence; but would be much more ſubject to the danger of ſliding in, eſpecially if there was any run of water in the ditch, which would undermine the ſod-work, and render it liable to be thrown down by froſt, by which means, the quick on the inſide of it, would be removed from its place, and make a breach in the line, which would both diſfigure and injure the fence.

ESSAY XII.

Of Farms, and of Farm-Houſes.

BESIDES the cheerfulneſs and ſalubrity of the ſituation, there are three other things which ſhould be particularly attended to in the choice of an eſtate or farm; theſe are, the air, the water, and the ſoil. This laſt is generally and deſervedly a matter of very deliberate conſideration; but intereſting as the two former certainly ought to be, yet they are, for the moſt part, far leſs the objects of attention, than their real importance demands.

The air ſhould be elaſtic, pure and temperate; the water plentiful, wholeſome, and eaſily attainable; and the ſoil ſhould be dry and fertile.

The knowledge of the healthineſs of the air is, as Lord Bacon obſerves, diſcoverable rather by experiment, than by reaſon or conjecture.

To examine the moiſture of the air, before a houſe is built, wool, or a ſponge may be hung up in the place, and afterwards compared with ſome of the ſame, expoſed in the ſame manner, and at the ſame time, in another place. According as they gain more or leſs in weight, the air is more or leſs humid.

The air is liable to greater alterations, from heat and cold, in ſome places than in others; and as that inequality is reckoned an enemy to health, the moſt equal ſhould be preferred. This is eaſily determined by the thermometer, and by examining the ſituation of the place: for the intermixture of hills and valleys, however pleaſing to the eye, is certainly no promoter of longevity; becauſe of the variations of the weather.

Open places, and champaign countries, are thought to be healthy, where the ſoil is dry, not parched or ſandy, where wild thyme and other aromatic plants grow ſpontaneouſly, and which is not naked, but interſperſed with trees and ſhrubs for ſhade. Yet the change of air in travelling, after being accuſtomed to it, is healthy: whence many travellers have proved long lived; as, indeed, have alſo many, who have dwelt conſtantly in the ſame cottage. A ruddy complexion, clear white of the eye, quick hearing, and diſtinct voice, are ſet down by Palladius, as marks of the healthfulneſs of the place, where theſe predominate amongſt its inhabitants.

The ancients were particularly attentive to the quality of the water, and the eaſe of coming at it. They adviſed bringing into the farm houſe, the water of a ſpring which never dries up, or if there be no ſuch ſpring within the farm, to bring the neareſt running water into it; or to dig for well-water, not of a bitter or brackiſh taſte. If neither of theſe were to be found, they directed large ciſterns to be provided for men, and ponds for collecting and retaining rain-water for cattle. They eſteemed that water to be beſt for drinking, which had its ſource in a hill: ſpring, or well-water from a riſing ground was deemed the next beſt: well-water in the bottom of a valley was reckoned ſuſpicious; and marſhy or fenny water, which creeps ſlowly on, was, by them, rightly looked upon as the worſt of all.

That water is moſt wholeſome, which has no mineral in it, is perfectly clear, depoſits no ſlimy ſediment, leaves no ſpots or incruſtation when boiled in veſſels of copper or braſs, and which boils pulſe in little time, which has no ſmell, and to uſe Palladio's expreſſion, "the beſt taſted water, is that which has no taſte."

Sir Thomas Elliot, in his Caſtle of Health, obſerves, that rain water is the moſt ſubtile and pure of any; the next, that which iſſues out of a ſpring facing the eaſt, and paſſes ſwiftly among great ſtones and rocks; and the third, is that of a clear river, which runs over hard ſtones and pebbles.

There are various means, ſays he, of trying which water is beſt; for inſtance, that which is of lighteſt weight; alſo that which produces leaſt ſcum or froth when boiled; that which will be ſooneſt hot. Or dip linen cloths in different waters, and lay them to dry, and the water which dries ſooneſt is the beſt and moſt ſubtile.

As ſprings and well-water paſs through beds of ſand, gravel, or ſmall ſtones, theſe clear it of all impurities, unleſs there be mixed with it, ſubſtances ſoluble in water. If any mineral be mixed with the water, it is unfit for the farmer's uſe. If it be hard, it is unfit for waſhing and many culinary uſes. This water gives the meat boiled in it, a red colour: but the hardeſt water may be rendered perfectly ſoft, and fit for any uſe, by mixing with it a ſmall proportion of pot-aſh, or other fixed alkaline ſalt, or for want of theſe, the aſhes of burnt vegetables.

Animal and vegetable ſubſtances, mixed with ſtagnating water, putrify and taint that water. This taint is moſt effectually carried off by boiling, during which, the putrid particles evaporate;

and whatever elſe remains in it will ſubſide when it is cold. It may alſo be much mended by having air forced through it by Dr. Hales's ventilator; or it may be corrected by mixing with it acids, ſuch as vinegar, juice of ſour fruits, a little oil of vitriol, or by throwing over the ſurface ſome powdered alum, the vitriolic acid of which will correct the putrid and volatile alkali therein, and its fine clay will carry down the other impurities.

When there is neither running, nor ſpring water, artificial ſprings may be made in the manner pointed out by Lord Bacon, who does not, indeed, ſay he had tried them himſelf, but they have been repeatedly tried ſince his time, and found to anſwer.

They are to be made upon a hanging ground, where there is a quick fall of rain water. A trench of a conſiderable length ſhould be dug three, four, or five feet deep in the ground, in the bottom of which a gutter ſtone ſhould be laid the whole extent. This trough or gutter ſtone ſhould be covered with brakes to a good thickneſs, and a body of ſand ſhould be laid over the brakes. After ſome ſhowers of rain, the lower end of the gutter ſtone will run like a ſpring of water, and this will continue for a long time after the rain is over, "As if, ſays that great philoſopher,

loſopher, the water did multiply itſelf upon the air, by the help of the coldneſs and condenſation of the earth, and the conſort of the firſt water."

A gentleman in France, whoſe manſion ſtood on a height, far from any water, was adviſed to make a long ditch, about a fathom deep, in the neighbouring higher grounds, and to fill it with ſand: he did ſo, and it continued to bring a plentiful ſupply of water for all domeſtic purpoſes.

M. de la Hire obſerves, in the Memoirs of the Academy of Sciences, for the year 1703, that rain water, which has been purified by paſſing through clean ſand, and is afterwards collected in ſubterraneous reſervoirs, will keep a long time without becoming putrid. He thinks this water the beſt that can be made uſe of, either for drinking or for other œconomical purpoſes, becauſe it is not impregnated with any mineral, as ſpring waters ſometimes are. In confirmation of this ſyſtem of M. de la Hire, we have the completeſt proof in the practice of the city of Venice, which is computed to contain upwards of two hundred thouſand inhabitants, who, in that hot climate, where rain only falls in two ſeaſons of the year, are ſupplied, by this excellent expedient, not only with water that is good for every purpoſe of life, but alſo in ſuch plenty, that, upon inquiry, I never

I never could find there had been any ſcarcity of that uſeful element, within the memory of man.

A great part of the cellars or vaults under the Venetian houſes, which from damp, are uninhabitable, are occupied by the reſervoirs neceſſary for containing this water in large quantities; and as I know of no country where there is not in ſome places of it, a ſcarcity of good water, I ſhall be the more particular in deſcribing the manner in which it is managed by the Venetians, and which I have examined on the ſpot. In the center of a large vault, a circular well is conſtructed either of ſtones or bricks, jointed and bedded, with a ſandy loam. If this well be intended to contain a very large quantity of water, its diameter muſt be regulated accordingly, or where ſpace is wanting, it may be ſunk below the floor of the vault, only taking care to build it ſo as to exclude every ſupply of adventitious water, which is beſt accompliſhed by building with terrace or puzzolana. That part of the well, which riſes above the floor of the vault, and which is not ſubject to any adventitious ſupplies, is to be conſtructed as above directed.

The floor of the vault, ſhould be laid with a ſmall declivity from every ſide towards the well in the center. At the end, or at both ends of the vault, a ſemi-circular ſpace is cut off by a wall, of the ſame conſtruction as that of the well above the level of the floor: theſe ſpaces, and indeed the whole of the vault excepting the well, are then to be filled with the cleaneſt and pureſt ſand that can be procured, nearly up to the edge of the well, and into theſe ſemi-circular ſpaces, the water from the roofs is to be conveyed by pipes. Here the water makes its firſt depoſit of the filth which it brings from the roofs, and therefore this is kept in a ſeparate chamber that it may be more eaſily cleaned by renewing the ſand, which may be neceſſary every four or five years; whereas once in twenty years will ſuffice for the intermediate ſpace. The water is next filtrated through the adjoining ſemi-circular wall, and gets into the great body of ſand in the large diviſion of the vault: from this it tranſudes into the circular well in the center, where in paſſing through the circular wall, it gets its fourth and laſt filtration, and is drawn pure from the well. From the upper edge of the well there ſhould be a waſte pipe to carry off the ſuperfluous water, when occaſion requires.

To theſe methods of obtaining plenty of good water, I ſhall here add the following eaſy way of correcting ſuch as is neither clear nor ſweet, aſcertained by ſeveral experiments made by the Society of Arts, &c. in London. This is by mixing of clay with the water, in ſuch quantity, that when the clay is diſſolved, the hand immerſed under the ſurface of the water, ſhall not be ſeen.

The clay ſubſiding carries down with it all impurities, and in a manner burying them, prevents their communicating any bad taſte or ſmell to the water, which hereby continues long clean and ſweet. The clay may probably correct ſtagnant water, and thereby preſerve it clear and good in dry ſeaſons, and may thus prove very uſeful, where there is no running water; but if any bad taſte or ſmell remain after uſing the clay, they may be carried off by one of the ventilators recommended for that purpoſe by the Rev. Dr. Hales.

The water thus fined down, in a caſk or deep ciſtern, and the clear, pure part remaining at top, may be drawn off by a cyphon, or by cocks placed in the caſk at different heights, ſo as to leave the mud or thick part at bottom.*

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* The great and learned Dr. Mead, ſpeaking of water which is of ſuch conſtant ſervice, not only for our drinks, but alſo in preparing of our meat and bread, that it may juſtly be ſaid to be the vehicle of all our nouriſhment, obſerves, that when ever this happens to have other properties than are neceſſary to fit it for this purpoſe, it is no wonder if in its paſſage through the body, theſe make ſuitable impreſſions there.

Thus,

The Romans had pleaſure, as well as profit, in view, when they bought or ſtocked a farm; and therefore they laid it down as a rule, that no degree of fertility ſhould tempt a man to purchaſe in an unhealthy country, nor the pleaſanteſt ſituation in a barren one. "Buy not too haſtily," ſaid the wiſe Cato, "but view again and again the purchaſe you intend to make; for if it be a good one, the oftener you ſee it, the better it will pleaſe you. Examine how the neighbouring inhabitants fare. Let the country it lies in be a good one; the ways to and from it good; and the air temperate. Let your land, if you can

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Thus, at Paris, where part of the city is ſupplied with water from Arcueil, which is ſo full of ſtony particles, that even the pipes through which it runs, are in time incruſted and choaked up; Dr. Liſter has obſerved, that the inhabitants are more ſubject to the ſtone in the bladder, than in moſt other places.

In like manner, let the groſs particles, with which the water is ſaturated, be of any other nature, metallic, ſaline, &c. theſe, according to their various gravity, the capacity of the canals, and ſuch like circumſtances, will, when they come to circulate in the human body, be by the laws of motion, depoſited in one part or other. So theſe mineral bodies, and nitrous ſalts, which abound in the ſnowy water of the Alps, do certainly enlarge and ſtuff the glands of the throat in thoſe who drink them, that ſcarce any who live there, are exempted from this inconvenience.

Quis tumidum guttur miratur in Alpibus.

Juvenal Satyr. xiii.

choose your ſituation, be at the foot of a hill, facing the ſouth, in a healthy place, where a ſufficiency of labourers, of cattle, and of water may be had. Let it be near a flouriſhing town, the ſea, or a navigable river; or border on a good, and well-frequented road.* Let the buildings on your ground be ſtrong and ſubſtantial. Do not haſtily condemn the methods of others. It is beſt to purchaſe from a good huſbandman, and from a good improver.†

To theſe very ſenſible and judicious directions, I will only here add, that the banks of rivers which run with a quick current on gravelly and ſandy bottoms, are both agreeable and healthy, but if the bottoms are oozy, and the banks marſhy, ſuch ſituations ought to be avoided: if led thither not from choice, but neceſſity, build on the ſouth ſide of the ſtream, becauſe the warm ſoutherly winds which promote putrefaction, and are the moſt frequent, blow the noxious vapours from your habitation; whereas the northerly winds which blow more ſeldom, blow ſtronger, check putrefaction, and ſpeedily diſpel the noxious vapours.

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* Good roads, canals, and navigable rivers, by diminiſhing the expence of carriage, put the remote parts of the country more nearly on a level with thoſe in the neighbourhood of the town. They are upon that account, the greateſt of all improvements. They encourage the cultivation of the remote, which muſt always be the moſt extenſive circle of the country. They are advantageous to the town, by breaking down the monopoly of the country in its neighbourhood. They are advantageous even to that part of the country; for though they introduce ſome rival commodities into the old market, they open many new markets to its produce. Dr. Smith, on the Nature and Cauſes of the Wealth of Nations. Lib. I. c. 11.

† *De Re Ruſtica*, Lib. I. c. 3.

A dry and gravelly ſituation is greatly to be preferred, but gravel is not always to be truſted, for it is often impregnated with water, till drained. A great drain or ſewer round the ſcite of a houſe, is therefore the proprietor's firſt neceſſary care: for that will not only carry away the moiſture in the ſoil, but will alſo convey off the foul water uſed for the various domeſtic purpoſes.

The farm houſe ſhould not be too large, becauſe that creates unneceſſary expence, but it ought to have ſome elegance, to give pleaſure to its poſſeſſors; and as Columella adds, to allure the wife to take delight in it.* It ſhould be built on the moſt healthy ſpot in the farm, if poſſible, near its center, and commanding a view of its fields.†

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* Lib. I. c. 4.

† Notwithſtanding the infinite number of books of architecture, I do not know of any one, which has treated of this ſubject with any degree of ability. I conſider it as an uſeful field yet unoccupied;

The other buildings, or out-houſes as they are called, ſhould be proportioned to the produce of the land, and the live ſtock which it is capable of maintaining.

Theſe out-houſes, with a good large pond for watering of cattle, and the waſhing of horſes, &c. muſt be arranged round the farm-yard, ſo as it may be roomy, and perfectly convenient; for this is a matter of much conſequence to the huſbandman.*

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unoccupied; but the architect who attempts it, ſhould be well informed in country affairs, ere he can inſure ſucceſs. A book on this ſubject ſhould not only contain deſigns of the dwelling-houſes, but alſo of the farm offices, or out-houſes adjoining.

* The materials to be employed in buildings of this kind, depend altogether upon the ſituation. Stone, bricks, or wood, are the uſual reſources of the builder; but there is yet another material, hitherto little uſed, which I would recommend to the ſerious attention of thoſe gentlemen and farmers who have out-houſes to erect; that is, thin plates of wrought iron, which may be applied to timbers roughly framed of native woods, as a cover both for roofs and ſide-walls. Theſe plates are light and laſting, and can be eaſily bent to any ſhape, or cut to any ſize: they are cheap, and may be preſerved from ruſt by means of a varniſh, of which I have here given the recipe; and which is at the ſame time of great utility for the preſervation of timber, or deals expoſed to the weather, as alſo for that of all the implements of huſbandry.

Take of oil of tar and common black roſin, equal quantities, by weight: put them into an iron pot over a fire, till the roſin is melted;

I have ſubjoined a liſt of the buildings neceſſary for a farm of five hundred acres of arable land, the largeſt quantity that any huſbandman can undertake to cultivate well and to advantage: when he exceeds that quantity, he may cultivate it, but it will neither be well done by, nor will it do well by him.

——— *Laudato ingentia rura,*
Exiguum colito.†———

Praiſe an extenſive farm, but cultivate a ſmall one, ſays Virgil, and indeed this was a precept univerſally adopted by the ancient Romans, who laid it down as a rule that the farmer ought to be ſtronger than the farm, for in the ſtruggle that muſt ariſe between them, if the farm be too ſtrong for the farmer, he muſt give way. That is, if the extent of his farm be ſuch, that he cannot beſtow a

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melted; for which purpoſe ſtir the contents from time to time: to every twenty pounds of theſe materials, add one pound of rough ſulphur, or brimſtone, which ſtir alſo, till the whole is melted and incorporated. To theſe add the colour required, ſuch as Spaniſh-brown, red or yellow ochre, red or white lead, (or any other colour you want) firſt ground fine with ſome of the oil, and in ſuch quantity, as to produce the ſhade that may be deſired. Then, let this be laid on with a painter's bruſh, as hot, and as thin as poſſible. Some days after, when the firſt coat is dried, give it a ſecond.

† Virg. Georg. Lib. II. l. 412.

due culture upon every part of it, he muſt become a very great loſer thereby. *Nec dubium* ſays Columella; *quin minus reddat laxus ager, non recte cultus, quam anguſtus eximie.* Certain it is, that a large farm ill cultivated, will produce leſs, than a ſmall one cultivated to perfection.

An infatuated rage for large farms, ſeems now equally prevalent with the land-owner and with the farmer; but for very different reaſons. The land-holder flatters himſelf that by throwing his eſtate into large farms, he gets a few ſubſtantial tenants, able to pay their rents with regularity; inſtead of many, who, being leſs wealthy, are more irregular in their payments, and more ſubject to fail. In this way too, there are fewer farm-houſes, and leſs expence in building and repairs: beſides, by thus depopulating the country, they will have fewer poor to provide for, and leſs poors-rate to pay.

All this is well reaſoned, if there were no ſubſtantial arguments to bring forward on the other ſide; whereas, there are many. A great farmer who is not extremely opulent, who is not extremely ſkilful, and who is not extremely prudent and induſtrious, is, by his over-ſtraining exertions, much more likely to fail, than a ſmaller one; in which caſe, the landlord may loſe five times the ſum that he would loſe by the failure of the latter, and this of courſe muſt derange him more. In this way, therefore, the landlord runs a much greater riſk, than in the other.

With reſpect to repairs of houſes and out-houſes, there may be a ſmall ſaving, though not ſo much, perhaps, as the landlord flatters himſelf with; for he ought to conſider, that not only the houſe itſelf, but alſo the out houſes muſt be proportioned to the ſize of the farm; and that middle ſized farms let higher in proportion than large ones, is an undoubted fact, ariſing from the greater number of bidders, and thereby creates an allowance for extra repairs. What I mean by middling ſized farms, are thoſe from two hundred to two hundred and fifty acres; of which, two thirds are arable. The landlord ought alſo to conſider, that by letting his land in large farms, he is loſing from off his eſtate a ſet of frugal and induſtrious men, who by bringing up families upon it, make the country more populous, and increaſe the demand for thoſe very proviſions which are raiſed upon his own lands, and thus tend greatly to enhance their value, which would otherwiſe fall to nothing, were every country gentleman to reaſon ſo improperly. The riches of a ſtate unqueſtionably conſiſts in the number of its induſtrious inhabitants: the ſame maxim holds good with regard to every land-owner.

Farmers are not ſurely the claſs of men, who fill the liſts of the poor in any pariſh, or increaſe the rates; it is the laboring ſervants of the farmers and their families, who are liable to this misfortune, and who become chargeable to the community. But it is abſurd to ſuppoſe that large farms diminiſh the number of laboring ſervants: if they are worſe cultivated, the number of ſervants will doubtleſs be diminiſhed, but here the cure is worſe than the diſeaſe: if they are as well cultivated the number will be nearly equal: if they are better cultivated, which is ſurely the object in view, then the number of ſervants muſt be increaſed: and thus the rates are increaſed, while the contributors thereto are diminiſhed, ſo that large farms cannot remedy an evil which is now become ſo great, and gives room for ſuch ſcenes of abuſe and of iniquity, that thoſe ill contrived, and worſe executed laws concerning the poor, including thoſe of ſettlements, together with the tythes as they now ſtand, are two of the moſt cruel and opreſſive taxes upon induſtry, that ever were levied in any country, the taille in France only excepted.

Theſe are objects of legiſlation, which would immortalize the name of that miniſter, whoſe ſuperiority of genius, enterprize, and fortitude, might qualify him for the glorious taſk of relieving the people of this country, from burthens, far more heavy to bear; than all their other public taxes.

On the other hand, we ſee the farmers themſelves not a little fond of farms ſo very extenſive, that they are perfectly unable to manage them: this prepoſterous paſſion in the huſbandman ought to put the land-holder greatly on his guard, for the former reaſons as fallaciouſly upon this ſubject, as the latter. A larger farm, ſays he, is as eaſily managed, and with almoſt as little expence as a ſmall one: being more extenſive, it will no doubt, produce more; and if there be a profit on a ſmaller quantity, there muſt certainly be a greater profit on a larger. This falſe method of calculating, their deſire of gain, their love of conſequence, tempt them to venture far beyond their ſtrength. Some neighbours of my own, with little ſkill, and with leſs capital, hold five or ſix hundred acres of land and upwards, on which they ſhould nett a clear gain of five or ſix hundred pounds a year, This laid up would accumulate, and anſwer for every emergency, ſuch as the proviſion for children, family diſtreſſes, diſeaſes, loſs of live ſtock, or unfruitful ſeaſons; inſtead of which I am well convinced, that theſe poor men do not ſave fifty ſhillings, after paying rent, intereſt of borrowed money, the expence of culture, and family maintainance. Thus they are carried through from year to year, by a perſevering induſtry, and rigid parſimony, rolling, like Siſyphus, a ſtone up hill; which at every movement, is ready to recoil, and overwhelm it's laborious conductor.

But ſuch a man is pointed out at church and fair as a great farmer, who holds ſix hundred acres of land, and thus his vanity is gratified, by the ſacrifice of more ſubſtantial enjoyment; which is no uncommon caſe in all ranks of life. Such a man with a farm of one hundred and fifty or two hundred acres of land, might have ſleeped ſound, have lived well, paid his rent and taxes, and laid up a reſerve of one hundred and fifty or two hundred pounds a year for uſeful purpoſes.

In conſidering this ſubject, I have always calculated twenty ſhillings per acre of clear profit to the huſbandman, after paying all expences; an allowance, I am certainly, well warranted to make, when there is no overſtraining, and no other internal canker, preying on the vitals of the ſkilful and induſtrious farmer.

Every man who is minutely ſkilled in farming, knows, that circumſtances frequently occur, from weather and otherwiſe, which demand immediate attention. A man who has a great extent of country in his hands, cannot at once ſeize that critical moment, which can be done by another, who who has no more land, than what may be eaſily attended to. Any man who has but a moderate farm, can certainly give the whole a more perfect culture. Thus, Columella relates a ſtory from Græcinus, of a farmer who having two daughters, gave the eldeſt at her marriage a third of his farm, and found his crops equally abundant from the remaining quantity. At the marriage of his ſecond daughter he gave her another third, and ſtill his produce continued the ſame.

The farmer who holds an extenſive farm, treads too cloſely on the heels of the ſquire, and is thus often led to fancy himſelf above the conſideration of more trivial objects; he is therefore apt to neglect intirely a number of uſeful articles, that the induſtrious huſbandman raiſes on a ſmall farm, ſuch as fowls, eggs, hogs, butter, &c. and which he brings daily to market. In theſe objects of domeſtic care, the wife is moſt uſefully employed, while ſhe and her children at leiſure hours are alſo engaged in preparing many articles for ſtaple manufactures of the country, which ſhe is thus able to do at a cheaper rate, than can be done by the manufacturer himſelf.

There is great advantage in having land well incloſed, and great beauty in having ſome plantations upon them, when properly diſpoſed of. There are ſcarcely any extenſive grounds, where ſome ſpots may not be ſelected for profitable as well as pleaſurable plantations; and ſmall ſpots ſkilfully choſen, have more effect than larger plantations ill placed. I have already had occaſion to mention thoſe kinds of lands which may be cultivated to the greateſt advantage in this way.

Many object to trees in hedge rows, alleging with truth, that their roots rob the plants near them of their nouriſhments, and that their ſhade, and drops from their leaves deſtroy, what their roots would have ſpared.

Theſe are certainly ſuch powerful arguments againſt continued rows, that even I, who am a profeſſed admirer of theſe noble and lofty productions of nature, am obliged to ſurrender, by capitulating for a few ſtraglers only, which I would moſt ardently wiſh to ſave, for the ſake of beauty.

There is an excellent practice in this county, which facilitates my plan of retaining ſome few foreſt trees in the hedge-rows; for, a hedge-green of twenty or thirty feet wide is generally left round our corn fields, which ſerves many uſeful purpoſes, and is at the ſame time extremely pleaſant and beautiful. As this border is always in graſs, it becomes firm and ſolid, and forms a commodious road round the field, for conveying off the produce, or bringing on the manure. It gives room for the plough horſes to turn, without poaching the land, which ever way the field is plowed. It produces both graſs to cut, and paſturage for cattle, and laſtly it affords a moſt agreeable walk for the farmer to ſurvey all the operations of the field, and alſo to examine from time to time the progreſs and ſtate of his crops.

The proſpect of thoſe field operations that prepare for theſe crops, the proſpect of the thriving corn, the proſpect of the yellow plenty, raiſe in the mind ſuch pleaſing ſenſations of proſperity, of the wealth of the community, and of the population, which flows from abundance, that I am not aſhamed to confeſs, ſuch exhilirating ſcenes, with all the animating reflections they inſpire, have in my eyes, far ſuperior beauties, to the moſt boaſted exertions of art, where ſilent groves are reflected by artificial rivers, and whole pariſhes are depopulated to pale round the boundleſs park, in order to indulge the ſullen pomp of ſequeſtered grandeur.

Nothing can be more different than the occupations and the pleaſures of the town and of the country, and when tranquility of mind and health of body are thrown into the country ſcale, how infinitely does it preponderate!

The charms of rural life are ſo beautifully deſcribed by Virgil, that I hope I ſhall be forgiven, for tranſcribing the following lines from the ſecond Georgic of that immortal poet.

" O fortunatos nimium, ſua ſi bona norint,
Agricolas! quibus ipſa, procul diſcordibus armis,
Fundit humo facilem victum juſtiſſima tellus. 460
Si non ingentem foribus domus alta ſuperbis
Mane ſalutantum totis vomit ædibus undam;
Nec varios inhiant pulchra teſtudine poſtes,
Illuſasque auro veſtes, Ephyreïaque æra;
Alba neque Aſſyrio fuſcatur lana veneno, 465
Nec caſia liquidi corrumpitur uſus olivi;
At ſecura quies, et neſcia fallere vita,
Dives opum variarum: at latis otia fundis,
Speluncæ, vivique lacus: at frigida Tempe,
Mugituſque boum, molleſque ſub arbore ſomni 470
Non abſunt. Illic ſaltus, ac luſtra ferarum,
Et patiens operum, exiguoque aſſueta juventus,
Sacra deum, ſanctique patres! extrema per illos
Juſtitia excedens terris veſtigia fecit.
Me vero primum dulces ante omnia Muſæ 475
Quarum ſacra fero ingenti percuſſus amore,
Accipiant; cœlique vias, et ſidera monſtrent:
Defectus ſolis varios, lunæque labores:
Unde tremor terris: qua vi maria alta tumeſcant
Objicibus ruptis, rurſuſque in ſe ipſa reſidant: 480
Quid tantum Oceano properent ſe tingere ſoles
Hyberni, vel quæ tardis mora noctibus obſtet.
Sin, has ne poſſim naturæ accedere partes,
Frigidus obſtiterit circum præcordia ſanguis;
Rura mihi, et rigui placeant in vallibus amnes: 485
Flumina amem, ſilvaſque inglorius: O! ubi campi,
Sperchiuſque, et virginibus bacchata Lacænis
Taygeta: O, qui me gelidis in vallibus Hæmi
Siſtat, et ingenti ramorum protegat umbra!

Felix, qui potuit rerum cognoſcere cauſas:
Atque metus omnes, et inexorabile fatum
Subjecit pedibus, ſtrepitumque Acherontis avari!
Fortunatus et ille; deos qui novit agreſtes,
Panaque, Sylvanumque ſenem, Nymphaſque ſorores!
Illum non populi faſces, non purpura regum
Flexit, et infidos agitans diſcordia fratres;
Aut conjurato deſcendens Dacus ab Iſtro:
Non res Romanæ; perituraque regna: neque ille
Aut doluit miſerans inopem, aut invidit habenti.
Quos rami fructus, quos ipſa volentia rura
Sponte tulere ſua, carpſit: nec ferrea jura,
Inſanumque forum, aut populi tabularia vidit.
Solicitant alii remis freta cæca, ruuntque
In ferrum; penetrant aulas et limina regum:
Hic petit excidiis urbem, miſeroſque penates,
Ut gemma bibat, et Sarrano indormiat oſtro.
Condit opes alius, defoſſoque incubat auro.
Hic ſtupet attonitus roſtris: hunc plauſus hiantem
Per cuneos, geminatus enim, plebeſque, patrumque
Corripuit: gaudent perfuſi ſanguine fratrum,
Exilioque domos et dulcia limina mutant;
Atque alio patriam quærunt ſub ſole jacentem.
Agricola incurvo terram dimovit aratro.
Hinc anni labor: hinc patriam, parvoſque nepotes
Suſtinet; hinc armenta boum, meritoſque juvencos.
Nec requies, quin aut pomis exuberet annus,
Aut fœtu pecorum, aut Cerealis mergite culmi:
Proventuque oneret ſulcos, atque horrea vincat.
Venit hyems, teritur Sicyonia bacca trapetis,
Glande ſues læti redeunt, dant arbuta ſylvæ.
Et varios ponit fœtus autumnus, et alte

Mitis in apricis coquitur vindemia ſaxis.
Interea dulces pendent circum oſcula nati:
Caſta pudicitiam ſervat domus: ubera vaccæ
Lactea demittunt; pinguesque in gramine læto 525
Inter ſe adverſis luctanter cornibus hœdi.
Ipſe dies agitat feſtos; fuſuſque per herbam,
Ignis ubi in medio, et ſocii cratera coronant:
Te libans, Lenæe vocat, pecoriſque magiſtris
Velocis jaculi certamina ponit in ulmo; 530
Corporaque agreſti nudat prædura palæſtra."

I propoſed to have given Dryden's tranſlation of theſe beautiful lines, for the information of my Engliſh readers; but upon looking over it, although far from a literal one, yet I found the neceſſary adherence to antient mythology and to ancient cuſtoms, rendered it not altogether intelligible to perſons unacquainted with that mythology and with thoſe cuſtoms: I therefore flattered myſelf that I could, perhaps, give a better idea of the pleaſures of *our* country life, by attempting an humble imitation of this divine poet; and, ſuch as it is, I venture to lay it before my reader. At the ſame time, in juſtice to Dryden, I ought certainly to premiſe, that whatever is good in the following verſes I owe to his elegant tranſlation; whatever is defective, I am afraid, I muſt take upon myſelf.

Ah happy, if his happy ſtate he knows,
The huſbandman who plows his fertile land;
From troubles free, enjoys a ſweet repoſe;
With food ſupply'd by nature's bounteous hand!

The princely palace, thro' whoſe lofty gates,
In crouds, the courtly levee bends it's way,
No envy in his breaſt, no wiſh creates,
Nor proud apartments, with profuſe diſplay.

He boaſts no ſtatues to adorn his hall,
Nor poliſhed mirrors circled round with gold,
No figur'd tap'ſtry hides his homely wall,
Nor tinſel garment glitt'ring plaits unfold.

He nor to ſilks, nor ſoft brocades pretends,
Nor purple damaſks of luxurious pride;
The coſtly ſpices either India ſends,
Are well by healthy appetite ſupplied.

An eaſy quiet, and a ſafe retreat,
A harmleſs life, devoid of foul chicane,
And home-bred plenty the rich owner wait,
With rural pleaſures ſporting in his train.

Unvex'd with quarrels, undiſturb'd with noiſe,
In peaceful induſtry time glides away:
He living lakes and flowery fields enjoys,
Woods, hills, and dales, and ſtreams that thro' them play:

And ſhady elms, that eaſy ſleep invite,
And hillocks green, where milky mothers browſe,
Where winged warblers in full ſong unite,
And golden plenty gladdens as it grows.

Here youths laborious, patient plow the ground,
Inured to hardſhips, and to homely fare:
While venerable age directs around,
And gives examples of productive care.

Nor are religious rites neglected here,
  Nor ſimple morals that incite to worth;
The firſt of virtues, is a ſoul ſincere,
  And miſery, and woes call pity forth.

Ere yet *Aſtræa** bade the world farewel,
  'Twas here ſhe paus'd, here ſought her laſt retreat;
'Twas here in guiltleſs groves ſhe lov'd to dwell,
  And here the prints of her departing feet.

Ye ſacred Muſes, with whoſe beauties fir'd,
  My ſoul was raviſhed in it's earlieſt years;
Who, in deſcending life, am ſtill inſpir'd,
  Ah grant your poet's laſt, but ardent pray'rs!

Let me on wings of ſcience ſoar ſublime,
  Give me the ways of wandering ſtars to know,
Give me the ſecret paths of heaven to climb,
  Explore her height, and depth of earth below.

Teach me the various labours of the moon,
  Why flowing tides prevail upon the main,
Why oceans ſwelling, burſt their barriers down,
  And in what dark receſs they ſhrink again.

From whence proceed th' eclipſes of the ſun,
  And why he ſpeeds to ſhorten winter-days,
And, when his ſhort diurnal race is run,
  What cauſe protracts the night with long delays.

But if my heavy blood reſtrains the flight
  Of my fond ſoul, aſpiring to be free;
If thus precluded from the unclouded light,
  Nature and nature's laws are hid from me,

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* The Goddeſs of Juſtice.

Ah then my next deſire is without care,
To lead ſecure, a quiet, inglorious life.
A cleanly cottage, in a cheerful air,
A pleaſant country, and contented wife.

Some god conduct me to the ſacred ſhades
Where contemplation dwells, and Sylvan ſong;
And O! attend ye ſweet harmonious maids,
To whom ſoft numbers and the lyre belong.

Happy the man! whoſe well accompliſh'd mind,
With buſtle weary, and by fortune tried,
Can from the croud retire, nor leave behind,
The glowing ardour of a virtuous pride:

Himſelf poſſeſſing in an equal ſtate,
His mind unmov'd the bribes of courts can ſee,
Fearleſs of fortune, and reſign'd to fate,
He ſcorns their pomp, and purple flattery.

Nor hopes the people's praiſe, nor fears their frown,
Nor when contending parties powerful ſtrive,
He courts not oppoſition, or the crown,
But prays devoutly, may the country thrive!

Without concern he hears, but hears from far,
Of tumults and deſcents, and diſtant broils;
Nor, ſuperſtitious, dreads approaching war,
From frightful ſigns, forboding dire turmoils.

Nor envies he the rich their treaſur'd ſtore,
Their ſplendid tables, or their coſtly wines;
Nor to a feeble pity for the poor,
The equal tenor of his mirth reſigns.

No luſt of wealth can tempt him from his place;
The ſenate's mad reſolves he never ſaw;
He never felt the courtier's foul diſgrace;
Nor heard the brawling buſineſs of the law.

Some arm'd with impudence invade the court;
In foreign countries others ſeek renown;
Some to the ſea, and ſome to camps reſort;
And ſome with raſh profuſion waſte their own:

For theſe delight in pomp, and proud parade,
In houſes, horſes, equipage, and dreſs;
And feaſts, and furniture, and plate diſpay'd,
Devote the thoughtleſs fools to dire diſtreſs.

To loll on ſophas rich with velvet flower;
Their guilty limbs on iv'ry beds to lay;
Ill fated India groans beneath their power,
Who ſtern, relentleſs, waſt her wealth away.

This wretch, in earth intombs his golden ſtore,
And broods o'er treaſures ne'er to be employ'd;
His great felicity to hoard up more;
His greateſt mis'ry leſt they be enjoyed.

Some patriot ſpeaker courts the people's praiſe,
With ſolid argument, and ſenſe approv'd
He all his powers of eloquence diſplays;
But brib'd majorities are never mov'd.

The crafty ſtateſman, arrogant, and vain,
His power and place at ſtake, all arts he tries;
Struggles his own importance to mantain,
Though Britiſh freedom fall the ſacrifice.

From all theſe ills, the huſbandman remote,
Calm, and content, avoids debate and noiſe;
To uſeful induſtry directs his thought,
And feels all bleſſings in domeſtic joys:

The circling year his daily taſk prepares;
By him the country markets are ſupply'd;
By him the town is fed, his fam'ly ſhares
The houſhold plenty, that remains beſide:

His wife, and tender children to ſuſtain,
His willing labor he with joy beſtows,
And grateful feeds his dumb deſerving train,
The ox, and fleecy ſheep, and milky cows:

Nor ceaſe his toils, till from the loaded field
A plenteous crop of golden grain is borne;
What fertile ſoils, with ſkilful culture yield,
Not loftieſt barns contain the vaſt return!

Thus every ſev'ral ſeaſon is employ'd,
And firſt, the hay ſweet ſcented harveſt brings;
And next the corn, by nymphs and ſwains enjoy'd;
Laſt the green flower, whence genial paſtime ſprings.

The winter comes, and then the falling maſt,
For greedy ſwine provide an ample meed,
Then oil from rape-ſeed runs, by mills expreſs'd,
And oily cakes the fat'ning cattle feed.

Mean while his cares have intervals of eaſe,
His little children climbing for a kiſs,
The partner of his pleaſures, ſtrives to pleaſe;
And courts his confidence, and crowns his bliſs.

His kine with ſwelling udders ſtand prepar'd,
Low for the pail, the milker's aid invite,
While ſteers and heifers in his homeſtal yard,
In playſome frolick, harmleſs battles fight.

Himſelf on holidays, in neat attire,
Invites his neighbours to the ſocial glaſs,
In gay convivial circle round the fire,
In converſe ſweet, the chearful minutes paſs.

The board is ſpread with diaper coarſe, but clean,
The produce of the wife's domeſtic care,
Amid the gueſts good-natured mirth is ſeen,
The farm ſupplies and full and wholſome fare.

Such is the delightful picture of the paſtoral life; drawn by this maſterly pencil; but laying aſide the enthuſiaſm of the poet, let us coolly reflect on the many and great advantages, in point of health, which perſons employed in agriculture, have over thoſe engaged in other purſuits.

Many of the employments by which great numbers of people are ſupported, are injurious to health, by being too ſedentary or too laborious; by which the powers of nature are either ſuffered to languiſh for want of exertion, or worn out prematurely by over fatigue. But the buſineſs of huſbandry is not neceſſarily connected with either of theſe extremes. The labor is indeed conſtant, but not in general ſo violent as either to exhauſt the ſtrength by over-ſtraining, or to excite any debilitating diſcharge by perſpiration. The variety likewiſe of the neceſſary buſineſs, is a favorable circumſtance for thoſe who are employed in it, as the different muſcles of the body are thereby exerciſed, and various poſtures uſed, which contribute to ſtrengthen the body more generally, and alſo to relieve the mind by a diverſity of attention.

A farther advantage attending the labor of huſbandry is, that it is performed in the open air, which is in general pure and wholſome, being free from ſmoke and other vapours ariſing from inflamed bodies, and alſo from putrid exhalations both of the animal and vegetable kind, which are well known to taint the air in large cities, and in all manufactories, where great numbers of people are aſſembled in a ſmall compaſs.

The ſurface or ſtaple of the ſoil, which is the ſubject of rural operations, does not give out any noxious vapours, like many of the mineral or metalline ſubſtances employed in ſeveral manufactures, but is at leaſt perfectly innocent, and has even been thought to produce effluvia rather favorable, than injurious to health. The number of vegetables likewiſe, with which perſons concerned in ſuch employments are generally ſurrounded, contribute to render the air, which is reſpired, pure and ſalubrious, by abſorbing the putrid and phlogiſtic ſubſtances that float in the atmoſphere.

The diet of perſons who live in the country is, ſurely, in general, more wholeſome than that of thoſe who inhabit towns. Sure I am, it is more natural, and leſs ſubject to ſophiſtication. A large portion of it conſiſts of freſh vegetables and milk, which, though not excluded from the food of thoſe who live in towns, are enjoyed in much greater plenty and higher perfection in rural ſituations. Theſe correct the putrefactive diſpoſition of animal food, and tend to keep up the proper ſecretions and evacuations, and to maintain that balance in the animal ſyſtem, upon which health ſo much depends.

The regular hours neceſſary to be obſerved by thoſe who follow country buſineſs, are perhaps of more conſequence than any of the other articles, however important thoſe may be.

It is an old and a common opinion, that the external air is much leſs ſalubrious during the night than the day; and this opinion which was probably firſt drawn from obſervation, ſeems to be confirmed by chemical experiments, which tend to ſhew that the air exhaled from vegetables whilſt the ſun is above the horizon, is much more pure and fit for reſpiration, than that which iſſues from them in the abſence of the ſun. The ill effects of the latter are beſt avoided, by the human body being in a ſtate of repoſe and inſenſibility, which makes it leſs liable to be affected by ſuch impreſſions. The morning air, on the contrary, ſo celebrated both by poets and philoſophers for its benign and cheering effects upon the mind and body, is enjoyed in high perfection in this way of life; and the advantages they derive from thence in regard to health, are probably very great.

Freedom from care and anxiety of mind, is a bleſſing which ſuch people ſurely enjoy in higher perfection than moſt others, and is of the utmoſt conſequence. Mental agitations and corroding cares are more injurious to health, and deſtructive of life, than is commonly imagined; and could their effects be collected, would make no inconſiderable figure in the bills of mortality.

The ſimplicity and uniformity of rural occupations, which admit of no ceſſation, preclude many anxieties and agitations of hope and fear, to which employments of a more caſual nature are ſubject. Nor is it the leaſt advantage to health accruing from ſuch a way of life, that it expoſes thoſe who follow it to fewer temptations to vice, than perſons who live in crouded ſociety. The accumulation of numbers always augments, in ſome meaſure, moral corruption; and with regard to health, the conſequences of vice which flow from corruption, are well known.*

Theſe are the agreeable effects of rural life, upon the health of mankind, without which bleſſing there can be no enjoyment; for without health, riches can purchaſe no pleaſure; nor can power or property procure happineſs.

But beſides the ineſtimable bleſſing of health, what ſources of pleaſure every where preſent themſelves to the philoſophic mind! The country life allows of leiſure for the ſtudy of books, as well as of men; and the works of nature in the animal and vegetable worlds afford boundleſs fields of philoſophical inveſtigation.

But the want of a country education, and a complete ignorance of country affairs, have always been conſidered as inſurmountable barriers, in the way of that perſon, who even feels in himſelf the ſtrongeſt propenſity for rural employments. But ſuch a perſon ought not to be afraid, if he will ſtudy books, attend carefully to the nature of his ſoil,† to the operations of his neighbours, and begin his own on a ſmall ſcale, extending them gradually as he gains experience.

It is again objected, that when theſe obſtacles are removed, new and greater difficulties are to be overcome; for it is commonly alleged that no man can ſucceed, who is not himſelf over every part of the buſineſs from morning to night, and who does not perform a painful and a laborious part. This truth is confirmed by proverbial ſayings, rendered ſacred by their antiquity; and thus it is affirmed that

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* Dr. Falconer in Bath Soc. Tranſ. Vol. IV. p. 341.

† Et quid quæque ferat regio, et quid quæque recuſet.
Virg. Georg. Lib, I.

He who by the plough would thrive,
Muſt either hold the plough, or drive.

This adage, however, is not to be taken literally; becauſe any farmer who cultivates five hundred acres of arable land, would loſe his time, in either holding or driving his plough, when he muſt have a great number of ſervants employed in a mulplicity of operations, which he ſhould ſee go forward under his own eye, by tranſporting himſelf from field to field to give the neceſſary directions.

This idea, therefore, of an aſſiduous ſuperintendance is much more correctly, as well as more elegantly expreſſed by Columella, when he ſays, "*Agro empio, niſi preſentia domini frequens operibus intervenerit, ut in exercitu cum abeſt imperator, cuncta ceſſent officia.*" The farm once bought, unleſs the maſter give frequent atendance to the neceſſary operations, all buſineſs is at a ſtand, as it is with an army, in the abſence of its general.

But may not this be carried ſtill farther, and may we not aſk with propriety, what manufacture, what mechanic trade, what branch of commerce can ſucceed, that is not overlooked by the eye, and conducted by the hand of a maſter?

Let us, therefore, laying prejudice aſide, compare the advantages and diſadvantages of the liberal and of the uneducated farmer; for advantages and diſadvantages are peculiar to each.

The latter will perhaps have a ſuperiority in an early and conſtant attendance, in a perfect knowledge of detail, and of prices; of the quantity of work to be done by his ſervants; of the quality of grain, &c. in a recollection of the effects of various ſeaſons from his infancy, in an attention to the moſt trivial ſavings, and trivial gains.—He will feel great diſadvantage, from having a rooted prejudice againſt every thing, but what he himſelf or his father has ſeen and practiſed; from being unable to keep any memoranda of his tranſactions; or accurate accounts; from being unable to make any calculations of what his operations are to coſt, and what his produce is to bring him in. This is a moſt important point, and makes it abſolutely neceſſary for a farmer to know a little of arithmetic, without which he is eternally groping in the dark—Reverſe this ſtatement, and you will thus diſcover the advantages and diſadvantages of what

I have called by way of diſtinction the liberal farmer, who, if he adds a ſufficient capital to his other ſuperiorities is, I contend, with equal prudence and attention, in a far preferable way to his uninſtructed and pains-taking competitor.

But let me be completely underſtood; for I by no means venture to aſſert, that a book-farmer is actually a good farmer, without practice and without experience;* all therefore which I have advanced goes only to ſay, that agriculture, like all other arts and ſciences is moſt perfectly underſtood, and muſt be followed with greateſt advantages, by thoſe who unite the theory with the practice.

After what are called the fine arts and liberal profeſſions, ſays Dr. Smith, there is perhaps no trade which requires ſo great a variety of knowledge and experience as agriculture. The innumerable volumes which have been written upon it, in all languages, may ſatisfy us that among the wiſeſt and moſt learned nations, it has never been regarded as a matter very eaſily underſtood. And, a little after he adds, The direction of operations, which muſt be varied with every change of the weather, as well as with many other accidents, requires more judgment and diſcretion than any of the mechanic trades, which are always the ſame, or nearly ſo. *

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* Uſus et experientia dominantur in artibus; neque eſt ulla diſciplina in qua non peccando diſcatur. Varro, Lib. I. c. 1.

On the one hand, therefore, the practical farmer ought not to ridicule the perſon who abounds moſt with theoretical knowledge; for if he is well founded in that, the practical part is acquirable with time and aſſiduity. On the other hand, the theoriſt ſhould not ridicule or upbraid the practical farmer for proceeding with great caution and circumſpection to any new modes of practice; for he ought to conſider that ſuch a man has not money to throw away in experiment, that he has a family depending on his ſucceſs, that what he has not been accuſtomed to, both he and his ſervants will go about aukwardly, and that oftentimes he can neither afford the labor nor the implements required for adopting this ſuperior practice, although he may approve of it, and be convinced of its utility.

I have already pointed out the methods by which any perſon, about to purchaſe or to take a farm, may make himſelf acquainted with the quality of the ſoil he is going to engage with: but leſt theſe ſhould appear more tedious or troubleſome than the purchaſer or farmer ſhould wiſh; or than time and opportunity will allow; it may be perhaps uſeful to ſuggeſt, that there is a more conciſe, but a more ſuperficial way of judging

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* Nature and Cauſes of the Wealth of Nations. B. I. c. 10.

from the appearance of the crops on the ground. If the land be poor, the crops will be thin, the ſtraw ſhort and the ears ſmall; if on the contrary it be rich, the crops will be thick, the ſtraw long, the ears large and full to the tops, and perhaps the corn will be lodged, which is a pretty ſure ſign of the ſtrength of the land. Where the red weeds or poppies abound, they denote a poor light ſoil; where thiſtles predominate, they are the mark of a ſtrong one. But where there is a profuſion of either in arable land, it is a proof that the farmer is ſlovenly, and the land foul.

It has been often mentioned as a rule, that when a farm is taken, three times its rent will ſtock and cultivate it; ſome ſay four times its rent. But this appears to me a very vague way of calculating, for every thing depends on the ſtate in which the land is found. I have therefore always eſtimated by the acre, and my manner of computing is, that if land be clean and in good heart, three pounds per acre will ſuffice to ſtock and to cultivate it; if clean and not in good heart it will require four pounds per acre; and if neither clean nor in good heart, five pounds per acre is the leaſt that ſhould be allowed. Thus two hundred acres of land, which I reckon a very good ſmall farm, will require one thouſand pounds to ſtock and to cultivate it to advantage; but at the ſame time, the farmer muſt not expect any conſiderable profit for the firſt two years, after which it ought to bring a clear income of two hundred to two hundred and fifty pounds a year after paying the intereſt of money expended; and this I inſiſt muſt be the caſe, wherever there is not ſome defect in point of rent, ſoil, or management.

The capital employed in agriculture, ſays the very learned and ingenious Dr. Smith, not only puts in motion a greater quantity of productive labor, than any equal quantity employed in manufactures; but in proportion too to the quantity of productive labor it employs, it adds a greater value to the annual produce of the land and labor of the country; to the real wealth and revenue of its inhabitants. In all the ways, in which a capital can be employed, it is by far the moſt advantageous to the ſociety.*

I cannot cloſe this eſſay to better purpoſe than by another quotation from this juſtly admired writer.

Upon equal or nearly equal profits, ſays Dr. Smith, moſt men will chuſe to employ their capitals in the improvement and cultivation of land, rather than in manufactures or in foreign trade. The man who employs his capital in land, has it more under his view and in his own power, and his fortune is much leſs liable to accidents,

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* Nature and Cauſes of the Wealth of Nations, B. II. ch. v.

than that of the trader who is frequently obliged to commit it not only to the winds and waves, but to the more uncertain elements of human folly and injuſtice, by giving credit in diſtant countries to men, with whoſe character and ſituation he can ſeldom be thoroughly acquainted. The capital of the landlord, on the contrary, which is fixed in the improvement of his land, ſeems to be as well ſecured, as the nature of human affairs can admit of.

Beſides, the beauty of the country, the pleaſures of a country life, the tranquillity of mind which it promiſes, and wherever the injuſtice of human laws does not diſturb it, the independency which it really affords, have charms that more or leſs attract every body: and as to cultivate the ground was the original deſtination of man, ſo in every ſtage of his exiſtence, he ſeems to retain a predilection for this primitive employment.*

I will therefore conclude in the language of Cicero,† "Omnium rerum ex quibus aliquid "conquiritur, nihil eſt Agricultura melius, nihil "uberius, nihil dulcius, nihil homine, nihil libero dignius."

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* Nature and Cauſes of the Wealth of Nations, B. III. ch. i.

† Offic. Lib. I.

End of Vol. II.

LIST of FARM-OFFICES or OUT-HOUSES neceſſary for a Farm of Five Hundred Acres arable, or upwards.

THREE ſpacious barns for wheat, for pulſe, for artificial graſſes.—See Vol. II. p. 220. and ſeq.

A drying room with a floor and flue adjoining to the wheat barn.—Vol. II. p. 22 and ſeq.

A ſtraw houſe.—Vol. II. p. 224.

Stables for twenty work horſes, if no other cattle are to be employed: but twelve horſes and twelve oxen are preferable, in which caſe it will be neceſſary to have ſtables for twelve laboring cattle.

Harneſs-room, chaff-houſe, and corn-binn, adjoining to each ſtable.

Stables for three riding horſes, or horſes for a chaiſe, or jockey cart, &c. &c.

A chaiſe-houſe.

Root-houſe for piling of cabbages and other winter-roots.—Vol. II. p. 12. and 81, &c.

Cow houſe for ten or twelve milch-cows, with penns for calves.

Feeding-houſe for twenty or thirty cattle.

A ſhed for ſwine, with various ſmaller ones for fattening hogs and a ſeparate yard.—Vol. I. p. 188.

A ſhed for meadow hay, with a ſpace at the end for binding and loading a cart or waggon.

A ſhed for clover hay with a like ſpace.—Vol. II. p. 408.

Houſes for fowls, ducks, turkies and geeſe.

A dung-ſtand in the yard, with a ſhed over it for ſmall implements—and privies, and pit for drainage.—Vol. I. p. 192.

A work-ſhop for repairing implements, &c.

Sheds for waggons, carts, ploughs, rollers, harrows and other large implements.

An airy and roomy granary raiſed from the ground and ſecured from vermin.—Vol. II. p. 236. and ſeq.

A cool dairy and larder.

A ſlaughter-houſe.

A brew-houſe and bake-houſe.

Sheds in the yard for the protection of horſes and cattle in the winter.

Sheds for two hundred ſheep.

To theſe add a well fenced rick-yard, with ſtands for ricks.—Vol. I. p. 301. and ſeq.

A well fenced farm yard, with a pond of good water. It ſhould be paved and ſheltered from cold winds; and all the ſheds for the protection of cattle and for the larger implements may be obtained by means of lean-toos to the ſides of the barns, between their projecting doors, and may be ſupported by poſts.

A pond for the reception of the ſuperfluous black water ſhould be ſo placed, as to flood a meadow or ſome other field, at the proper ſeaſons.

LIST of the IMPLEMENTS moſt uſeful in Huſbandry.

WHEEL ploughs for two horſes only in the heavieſt land.—Vol. I. p. 202 and ſeq.

Light ſwing Rotherham plough. — Vol. I. p. 203, and ſeq.

Chiſſel-ſhared plough, with double mould board.

The wheel plough for deep ſtirring.—Vol. I. p. 213, and ſeq.

The trenching plough for clover-lays &c.—Vol. I. p. 211.

The ſlicing plough for ſtubbles.—Vol. I. p. 212.

The drill-plough and horſe-hoe.—Vol. I. p. 249, and ſeq.

The ſcarificator for meadows and paſtures.—Vol. II. p. 344, and ſeq.

Heavy harrows for rough ground.

Lighter dittos for common uſe.

Lighteſt dittos for ſmall ſeeds.

The ſpiky roller for clotty land.

The plain ditto for graſs lands, &c. two different weights.

Waggons and carts, with ſix inch wheels.—Vol. I. p. 301.

Small mould dittos with ſix inch wheels.

Jockey-cart, and pierced ditto for watering with black water.

The drag-rake for ſtubbles.

A tarpawling with blocks &c. which, if not uſed for building hay-ricks, is uſeful for covering corn, hay, or ſtraw ſent to market.—Vol. II. p. 408.

Scaffold for building of hay-ricks.

Chimneys for ditto.—Vol. II. p. 407, and ſeq.

Covered trough for feeding hogs or ſheep.

Standing racks for ditto.

A chaff-cutter by Pyke.

A winnowing machine.—Vol II. p. 235.

A threſhing mill.—See Appendix.

A malt mill, and one for grinding barley, peaſe, &c. for cattle.

Scales and weights for five hundred weight at leaſt.

Standard Wincheſter meaſures, and thoſe of the particular county where the farm is.

N. B. Beſides the above, there is an infinite number of ſmaller, more common, but leſs expenſive utenſils, ſuch as, harneſs, wheel-barrows, hay-forks, dung-drags, ſpades, ſhovels, mattocks, rakes, hoes, ladders, hay-cutters, corn-ſcreens, wire-ſieves, baſkets, ſacks, ſeed-cots, cradle-ſcythes, &c. &c. &c.

APPENDIX.

THAT part of this work which treats of the threſhing of corn, having been ſent to the preſs before I received the following information, I think it may prove uſeful to add it here.

There are two brothers of the name of MIECKLE, who reſide in Scotland, and have invented a machine for threſhing, for which they have a patent. They aſſure us, that this invention has not been offered to the public, till repeated trials have eſtabliſhed the certainty and perfection of its operations.

This mill may be worked by two horſes, or any power of wind or water equal to that force. The work performed is twenty-four buſhels of barley, or oats, in an hour; wheat and other grain in proportion :—but they do not favor us with that proportion. The corn is not only completely ſeparated from the ſtraw, but made ready for market, by being ſifted and cleaned from the chaff and other trumpery. The attendance required is that of three men, women, or boys: one to feed the mill, one to hand up the corn to the feeder, and another to remove the ſtraw, with a boy to drive the horſes.

A great ſaving, ſay theſe gentlemen, ariſes from the perfect clearing of the ſtraw, which is computed by the beſt judges to amount to three or four buſhels an acre averagely. Any common barn will admit of the erection of this machine, as it requires only an area of ten feet ſquare. But the large wheel, and the walk for the horſes, requires a ſpace of twenty-eight feet diameter, on the outſide of the barn.

Gentlemen may either erect the machine themſelves, upon a plan and licence to be furniſhed by the inventors, or the inventors will contract to erect them at a fixed price.

The expence of the machine, executed in the beſt manner, with all the wheels of caſt iron, I am informed is ſixty pounds. And when the plan with inſtructions and licence are only furniſhed by the inventors, their charge is then five guineas.

Their addreſs is, to Mr. ANDREW MIECKLE, at *Knowſmill*, by *Dunbar*; or to Mr. GEORGE MIECKLE, at *Alloa*, *North-Britain*.

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